CLASS 398, OPTICAL COMMUNICATIONS

SECTION I - CLASS DEFINITION

This class provides for all types of communication systems in which optical signals are used to transmit modulated carrier wave information between points. Such communication includes transmitting an intelligence-bearing signal from one point to another in the form of variations in a characteristic of the light wave. The communication may be through free space, fibers or waveguides. These are used to transfer the information with an optical beam, and this beam can be used in various communication schemes to enable the most effective or desired method of moving the information, including optical multiplexing when plural information signals or plural transmitters and receivers are utilized.

(1) Note. "Light" includes infrared and ultraviolet radiation.

(2) Note. The characteristic which is varied may include, e.g., amplitude, frequency, phase, polarity, or color.

(3) Note. This subclass includes subject matter that communicates data or information from one location to another via some optical system.

(4) Note. Apparatus having a source of light signal containing information to be conveyed to a light source via an optical link are classified in this and indented subclasses regardless of the source being controlled by a different form of energy (e.g., electrical or electromagnetic field) or the optical output of the sensor being converted to a different form of energy.

(5) Note. Optical communication to objects only within a predetermined location (i.e., direction) from the source would be classified in this or indented subclasses since the prime objective is to communicate information and the actual location is only a factor to ensure that the message goes there. The detection of range, direction, etc., of the object, without any data communication to that object, would not be classified herein. See Search note below for such device communication..

(6) Note. Optical switching to perform a specified function would be classified with the function. Optical switching in an optical communication system, where data is moved from one location to another, is classified in this or indented subclasses. Optical switching, per se, is excluded from this class. See Search note below for such device.

(7) Note. The optical communication systems of this and indented subclasses transfer optical data from one location to another via a data link but no specific sensor is set forth in the claims. The optical telemetry includes the combination of an optical communication system, as in this class or the indents thereunder, combined with a specified claimed sensor is excluded from this class. See Search not below for such subject matter. Well bore telemetry using any type of energy (i.e., radio, acoustic, magnetic, optic, etc.) is also excluded from this class. See Search note below for such device.

(8) Note. Optical communication by turning the light on and off without any modulation of the transmitted light is not classified in this class. See Search note below for such subject matter.

(9) Note. Optical communication system in combination with electrical communication system is excluded from this class. See Search note below for such combination.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

116, Signals and Indicators, appropriate subclasses, particularly subclass 20 for heliographic signaling wherein signals are given by mechanically-controlled intermittent flashes of light, usually reflected sunlight.

250, Radiant Energy, subclasses 200 through 239 for electrical circuits whose operations are controlled by means of a photocell, electrical circuits for supplying current or potential to a photocell and photocells in combination with optical means for controlling the radiant energy

which illuminated the photocell; subclasses 336.1-395 for systems for detecting the presence of or measuring the quantity or quality of invisible radiant energy rays; and subclass 551 for an optical signal isolator, per se.

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 13, 79-103 for incoherent light emitting injection luminescent devices.

315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for control systems for controlling the operation of end load electric lamp or discharge device.

329, Demodulators, for demodulation of modulated electrical signals.

330, Amplifiers, subclass 59 for amplifiers having light-controlled or activated devices, and subclass 308 for amplifiers having radiant energy impinging on a semiconductor.

331, Oscillators, subclass 66 for electrical oscillators with a device responsive to heat or light.

332, Modulators, for modulators of electrical signals.

333, Wave Transmission Lines and Networks, appropriate subclasses.

340, Communications: Electrical, subclasses 553+ for wellbore telemetry using an type of energy (1.e., radio, acoustic, magnetic, optic), particularly subclasses 853.1-856.4 for wellbore telemetry or control that could use optical energy, and subclasses 870.28-870.29 for telemetering systems employing radiant energy beam (e.g., Infrared) transmission.

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for radio wave range and direction finding apparatus (Range and Direction Finding).

348, Television, subclasses 335 through 369 for optical structures in a television camera.

352, Optics: Motion Pictures, subclasses 1 through 37 for motion picture apparatus with sound accompaniment.

356, Optics: Measuring and Testing, subclasses 3 through 22 for an optical range or remote distance finding apparatus, subclasses 27-28.5 for optical velocity measuring, and subclasses 138-155 for optical angle measuring or axial alignment.

359, Optical: Systems and Elements, appropriate subclasses.

360, Dynamic Magnetic Information Storage or Retrieval, subclass 3 for motion picture film, subclass 114 for magneto-optic head.

361, Electricity: Electrical Systems and Devices, subclasses 173 through 177 for relay or electromagnet circuits utilizing photosensitive devices.

362, Illumination, subclasses 257 through 311 for light source and modifier, and subclasses 317-361 for light modifier.

365, Static Information Storage and Retrieval, subclass 108 for liquid crystal radiant energy type.

367, Communications, Electrical: Acoustic Wave Systems and Devices, appropriate subclasses, subclass 131 for underwater acoustic communication system.

369, Dynamic Information Storage or Retrieval, subclasses 100 through 125 for information or sound recording or reproduction utilizing electro-optical transducers or photographic sound records.

370, Multiplex Communications, appropriate subclasses, subclasses 310 through 350 for communication over free space, subclasses 351-430 for packet switching.

372, Coherent Light Generators, appropriate subclass for laser amplifiers and oscillators.

374, Thermal Measuring and Testing, subclasses 121 through 133 for radiation responsive thermometers.

375, Pulse or Digital Communications, subclasses 219 through 223 for transceivers operated at radio frequencies.

378, X-Ray or Gamma Ray Systems or Devices, appropriate subclasses.

379, Telephonic Communications, subclasses 56.1 through 56.3 for a light wave link for speech or a paging signal, subclasses 74-77 for remote control over a telephone line, and subclass 379 for an optical link between the line and switching system used as a part of the line or loop condition detection.

380, Cryptography, subclass 54 for encryption/decryption by modifying an optical image, subclasses 255-276 for communication system using cryptography, particularly subclass 256 for fiber optic network using cryptography.

385, Optical Waveguides, subclass 15 for optical coupler, subclass 31 for input/output coupler, subclasses 311-114 for optical transmission cable, subclasses 115-121 for optical fiber bundle.

386, Television Signal Processing for Dynamic Recording/Reproducing, appropriate subclasses for television recording in combination with optical beam control.

455, Telecommunications, appropriate subclasses for Radio Frequency Telecommunications.
709, Electrical Computers and Digital Processing Systems; Multiple Computer or Process Coordinating, appropriate subclasses.

SUBCLASSES

1 FAULT RECOVERY:
This subclass is indented under the class definition. Subject matter wherein a corrective action is taken to return an inoperative or disfunctioning optical communication system or its component to a satisfactory operating condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
17 through 24, for detection of a fault in the optical communication network or its components.
10 through 15, for fault location determination.

SEE OR SEARCH CLASS:
370, Multiplex Communications, subclasses 216 through 228 for fault recovery.
714, Error Detecting/Correction and Fault Detecting/Recovery, subclasses 2 through 24 for fault recovery in a generic digital data processing system.

2 Bypass inoperative element:
This subclass is indented under subclass 1. Subject matter including a provision for alternate routing when the network or its component is at fault.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 825.16 for selective communication monitoring in a faulty condition.
370, Multiplex Communications, subclasses 217 through 220 for bypass an inoperative switch or inoperative element of a switching system, subclasses 221-224 for bypass an inoperative station, and subclasses 225-228, for bypass an inoperative channel.

3 In a ring or loop:
This subclass is indented under subclass 2. Subject matter wherein the inoperative element is in a closed path transmission system.

SEE OR SEARCH CLASS:
370, Multiplex Communications, subclass 222 for bypass in a ring or loop network.

4 Using a secondary ring or loop:
This subclass is indented under subclass 3. Subject matter wherein the inoperative element is bypassed by using an auxiliary closed path transmission system.

SEE OR SEARCH CLASS:
370, Multiplex Communications, subclasses 223 through 224 for bypass in a ring or loop network using a secondary ring or loop.

5 Spare channel or standby optical fiber:
This subclass is indented under subclass 2. Subject matter including a main and a backup or redundant equipment or line activated to route information data when the main line is at fault.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 825.01 for selective communications with a spare channel.
370, Multiplex Communications, subclass 227 for bypass an inoperative channel in a repeater using spare channel and subclass 228 for bypass an inoperative channel using a spare channel.
714, Error Detection /Correction and Fault Detection /Recovery, subclass 4 for masking or reconfiguration of transmission network which is not limited to optical communication.

6 In a repeater system:
This subclass is indented under subclass 1. Subject matter wherein the fault recovery or faulty optical communication system has at least one retransmission station.

SEE OR SEARCH THIS CLASS, SUBCLASS:
18, for detecting of a fault in a repeater.

11, for locating a fault in a repeater.
173 through 181, for an optical repeater system.

SEE OR SEARCH CLASS:
370, Multiplex Communications, subclass 226 for bypass an inoperative channel in a repeater.
379, Telephonic Communications, subclass 4 for nonmultiplex telephone alternate routing around a faulty repeater.

7 WDM:
This subclass is indented under subclass 1.
Subject matter wherein the faulty optical communication system includes a wavelength division multiplexed system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
14, for diagnostic testing of a WDM system.
34, for determination of communication parameter in a WDM system.
68, for broadcasting or distributing of wavelength division multiplexed signal.

8 TDM:
This subclass is indented under subclass 1.
Subject matter wherein the faulty optical communication system includes a time division multiplexed system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
35, for determination of communication parameter in a TDM system.
98, for time division multiplexing system.

9 DIAGNOSTIC TESTING:
This subclass is indented under the class definition. Subject matter including means for monitoring or testing for evaluating an operational condition of an optical communication system or its component.

SEE OR SEARCH THIS CLASS, SUBCLASS:
33, for determination of communication parameter having predetermined monitoring of a supervisor signal.
177, for specific repeater system including means for monitoring an optical regenerative repeater during operation.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 853.3 for diagnostic monitoring or detecting operation of a generic communication equipment or signal.
356, Optics: Measuring and Testing, for optically testing of individual pieces of an optical communication system, subclass 73.1 for optical fiber or waveguide inspection.
370, Multiplex Communications, subclasses 241 through 253 for diagnostic testing other than synchronization.
375, Pulse or Digital Communications, subclasses 224 through 228 for testing of pulse or digital communication system
379, Telephonic Communications, subclasses 1 through 33 for diagnostic testing of telephone equipment.
714, Error Detection/Correction and Fault Detection/Recovery, subclass 712 for the electrical testing of transmission facility.

10 Fault location:
This subclass is indented under subclass 9.
Subject matter including means for determining a position or site of a fault of the optical communication network or its component.

SEE OR SEARCH THIS CLASS, SUBCLASS:
1 through 8, for fault recovery of the optical communication network or its component.
17 through 24, for detection of a fault in the optical communication network or its component.

SEE OR SEARCH CLASS:
370, Multiplex Communications, subclasses 242 through 245 for fault detection.
714, Error Detection/Correction and Fault Detection/Recovery, subclasses 25 through 57 for fault location in a generic digital data processing system.

11 Repeater:

This subclass is indented under subclass 10. Subject matter wherein the component comprises a retransmission station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

6, for fault recovery in a repeater system.
18, for fault detection in a repeater.
173 through 181, for an optical repeater system.

SEE OR SEARCH CLASS:

370, Multiplex Communications, subclass 243 for fault detection of a repeater and subclass 246 for diagnostic testing of a repeater.
375, Pulse or Digital Communications, subclass 213 for testing of a digital repeater.
379, Telephonic Communications, subclass 4 for nonmultiplex telephone alternate routing around a faulty repeater.
714, Error Detection /Correction and Fault Detection /Recovery, subclass 713 for generic testing of a communication channel including a repeater.

12 Switch:

This subclass is indented under subclass 10. Subject matter wherein the component comprises an optical switch.

SEE OR SEARCH THIS CLASS, SUBCLASS:

19, for fault detection of a switch.

SEE OR SEARCH CLASS:

370, Multiplex Communications, subclass 244 for fault detection of a switching system

13 Fiber or waveguide:

This subclass is indented under subclass 10. Subject matter wherein the component comprises a) a single or bundle of fiber used as a single transmission medium to propagate optical energy or b) a system of material designed to confine direct optical waves in a direction determined by its physical boundary.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for fault detection of an optical fiber.
110, for remote control system in an industrial or hazardous environmen t through optical fiber or wave guide
113, for remote control syste m through optical fiber or wave guide.
116, for hybrid communication system including optical fiber.
134, for a photo-phone transducer including optical fiber or waveguide.
141, for transmitter and receiver system including optical waveguide, and subclass N3 for specific type of fiber.
139, for optical transceiver including optical fiber or wave guide.
178, for optical repeater including optical wave guide.
200, for tra nsmitter including optical wave guide
214, for optical waveguide in an optical receiver.

SEE OR SEARCH CLASS:

356, Optics: Measuring or Testing, subclass 73.1 for fibers testing.

14 WDM:

This subclass is indented under subclass 10. Subject matter wherein the optical communication network includes a wavelength division multiplexed system in which optical signals are multiplexed in a wavelength domain.

SEE OR SEARCH THIS CLASS, SUBCLASS:

7, for fault recovery in a WDM system.
34, for determination of communication parameter.
68, for broadcasting or distributing of wavelength division multiplexed signal.

15 Stop transmission or reduce power:

This subclass is indented under subclass 10. Subject matter including a safety means for cutting-off or limiting transmission power in response to a determined fault.

SEE OR SEARCH THIS CLASS, SUBCLASS:

38, for determination of power parameter in the optical communication network.

94, for feedback power control in a multiplexing wavelength division or frequency division.

120, for power compensation in a free space optical communication system.

197, for feed back power compensation in a transmitter.

16 Test signal:

This subclass is indented under subclass 1.

Subject matter wherein the operational condition of an optical communication network or its component is monitored for testing or evaluating using an external stimulus signal.

17 Fault detection:

This subclass is indented under subclass 1.

Subject matter including means for determining the presence of a fault of the optical communication network or its component.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1 through 8, for fault recovery of the optical communication network or its component.

10 through 15, for fault location determination.

18 Repeater:

This subclass is indented under subclass 17.

Subject matter wherein the component comprises a retransmission station.

SEE OR SEARCH THIS CLASS, SUBCLASS:

6, for fault recovery in a repeater.

11, for fault location of a repeater

173 through 181, for an optical repeater system.

SEE OR SEARCH CLASS:

375, Pulse or Digital Communications, subclass 213 for testing of a digital repeater.

379, Telephonic Communications, subclass 4 for telephone alternate routing around a faulty repeater.

714, Error Detection /Correction and Fault Detection /Recovery, subclass 713 for generic testing of a communication channel including a repeater.

19 Switch:

This subclass is indented under subclass 17.

Subject matter wherein the component comprises an optical switch which opens or closes circuit, completes or breaks a path, or selects paths or circuits.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12, for fault location of a switch.

20 Optical fiber:

This subclass is indented under subclass 17.

Subject matter wherein component comprises a single or bundle of fiber used as a single transmission medium to propagate optical energy.

SEE OR SEARCH THIS CLASS, SUBCLASS:

13, for fault locat ion in an optical fiber or wave gu ide.

110, for remote control system in an industrial or hazardous environmen t through optical fiber or wave guide

113, for remote control syste m through optical fiber or wave guide.

116, for hybrid communication system including optical fiber.

134, for a photo-phone transducer including optical fiber or waveguide.

141, for transmitter and receiver system including optical waveguide, and subclass N3 for specific type of fiber.

139, for optical transceiver including optical fiber or waveguide .

178, for optical repeater including optical waveguide .

200, for transmitter including optical waveguide

214, for optical waveguide in an optical receiver

13, for testing of fiber or waveguide.

SEE OR SEARCH CLASS:

356, Optics: Measuring or Testing, subclass 73.1 for fibers testing.

21 Determined by reflection from break in fiber:

This subclass is indented under subclass 20.
Subject matter including a reflectrometry means for determining selected parameter from a reflected optical energy on return from a transmission fiber to detect a fault (e.g. a break) in the fiber.

SEE OR SEARCH CLASS:
370, Multiplexing Communications, appropriate subclasses.

22 Transceiver:

This subclass is indented under subclass 17.
Subject matter wherein the component includes an optical transmitter and receiver at a common location for transmission and reception of separate signals.

SEE OR SEARCH THIS CLASS, SUBCLASS:
135 through 139, for specific of an optical transceiver.

23 Transmitter:

This subclass is indented under subclass 17.
Subject matter wherein the component includes an optoelectric circuit having an optical modulator for converting an incoming electrical information signal into modulated light wave signal suitable for propagation through or along a transmission medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:
182 through 201, for an optical transmitter.

24 Receiver:

This subclass is indented under subclass 17.
Subject matter wherein the component includes an optoelectric circuit having at least an optical demodulator for converting a received modulated light wave signal into an electrical information signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
202 through 214, for specific of an optical receiver.

25 Determination of communication parameter:

This subclass is indented under subclass 9.
Subject matter including means for measuring or calculating a particular communication parameter.

(1) Note. A particular communication parameter includes, for example, traffic noise ratio, freeze out ratio, etc.

SEE OR SEARCH CLASS:
370, Multiplex Communications, subclasses 252 through 253 for determination of communication parameters.

26 Signal to noise ratio:

This subclass is indented under subclass 25.
Subject matter wherein the parameter is a ratio of a usable light signal being transmitted to the noise or undesired signal.

27 Bit error rate:

This subclass is indented under subclass 25.
Subject matter wherein the parameter is a percentage of received bits in error compared to a total number of bits received.

28 Fiber characteristic:

This subclass is indented under subclass 25.
Subject matter wherein the parameter represents an effect of a fiber on the optical communication network due to transmission property of the fiber.

SEE OR SEARCH CLASS:
356, Optics: Measuring or Testing, subclass 73.1 for fibers testing.

29 Dispersion:

This subclass is indented under subclass 28.
Subject matter including means for determining a) a degree of scattering taking place in a light beam as it travels along the fiber or b) a degree of overlapping of a light signal on one wavelength to different wavelengths because of reflected ray and different refractive index of fiber material.

30 Using supervisory signal:

This subclass is indented under subclass 25.
Subject matter wherein control signal informa-

tion is used to determine at least one communication parameter.

SEE OR SEARCH THIS CLASS, SUBCLASS:
181, for supervisory signal in an optical repeater.

31 Different wavelengths for diagnostic and communication:
This subclass is indented under subclass 30. Subject matter wherein the supervisory signal has a different wavelength than that of for message transmission.

32 Pilot signal:
This subclass is indented under subclass 30. Subject matter wherein the supervisory signal is a different frequency control signal used as a subcarrier of a modulated transmitted optical signal.

33 Monitoring:
This subclass is indented under subclass 30. Subject matter including means for monitoring the supervisory signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
177, for monitoring of an optical repeater system.
181, for an optical repeater with supervisory signal.

34 WDM System:
This subclass is indented under subclass 25. Subject matter wherein particular communication parameter of a wavelength division multiplexed system in which optical signals are multiplexed in a wavelength domain is determined.

SEE OR SEARCH THIS CLASS, SUBCLASS:
7, for fault recovery in a WDM system.
14, for testing of a WDM system.
68, for broadcasting or distributing of wavelength division multiplexed signal.

35 TDM system:
This subclass is indented under subclass 25. Subject matter wherein particular communication parameter of a time division multiplexed system in which optical signals are multiplexed in a time domain is determined.

SEE OR SEARCH THIS CLASS, SUBCLASS:
8, for fault recovery in a TDM system.
98, for time division multiplexing system.

36 Collision detection:
This subclass is indented under subclass 25. Subject matter including means for determining if a condition resulted from different stations trying to use a shared optical bus simultaneously has taken place.

37 Amplifier or repeater operation:
This subclass is indented under subclass 25. Subject matter wherein the particular communication parameter is related to a performance of an amplifier or a repeater.

SEE OR SEARCH CLASS:
330, Amplifier, subclass 1 for an amplifier combined with diverse type art devices.

38 Power:
This subclass is indented under subclass 25. Subject matter wherein the particular communication parameter is a power parameter.

(1) Note. This subclass includes, for examples, determination of power loss or power supplied.

SEE OR SEARCH THIS CLASS, SUBCLASS:
15, for power control in response to a fault.
94, for feedback power control in a multiplexing wavelength division or frequency division.
120, for power compensation in a free space optical communication system.
197, for feed back power compensation in a transmitter.

39 INTERFERENCE SIGNAL TRANSMISSION OR ELIMINATION (E.G., JAMMING OR ANTIJAMMING):
This subclass is indented under the class definition. Subject matter wherein a signal, used to interfere with a selected signal so as to prevent

the intelligible reception of the selected signal, is either transmitted or eliminated.

(1) Note. The jamming signal of this subclass is independent of information signal.

SEE OR SEARCH CLASS:
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 13 through 20 for radio wave jamming and antijamming.
380, Cryptography, subclasses 252 through 254 for concealment of information by masking (i.e., coding) of an interference-bearing signal.
455, Telecommunications, subclass 1 for interference signal transmissions (e.g., jamming) that is telecommunication, not optical signals.

40 EAVESDROPPING:
This subclass is indented under the class definition. Subject matter wherein the information content of an optical communication message intended for one receiver is obtained secretly by another is avoided, or the transmitter or intended receiver is notified that an unintended receiver is receiving the signal.

SEE OR SEARCH CLASS:
379, Telephonic Communications, subclass 35 for listening-in or eavesdropping type telephonic service monitoring or observation.

41 DUPLEX:
This subclass is indented under the class definition. Subject matter wherein a single optical link between an optical transmitter and receiver permits simultaneous transmission and reception of plural optical signals in the same or opposite directions.

(1) Note. Full duplex allows the simultaneous transmission in either of two directions, but only one direction at a time.

(2) Note. Half duplex allows data transmission in either of two directions, but only one direction at a time.

SEE OR SEARCH THIS CLASS, SUBCLASS:
135 through 139, for optical transceivers which transmit a signal in response to the received signal.

42 Wavelength division:
This subclass is indented under subclass 41. Subject matter wherein bi-directional transmission over a single fiber is permitted by causing two light beams to travel in different wavelength bands and different directions within the same medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:
79 through 97, for wavelength division only in one direction within the same medium for multiplexing purposes.

43 MULTIPLEX:
This subclass is indented under the class definition. Subject matter wherein two or more information signals are controlled to be interleaved or simultaneously transmitted in either or both directions over a same transmission medium in such a manner that individual information signal may be directly recovered.

(1) Note. The use of a waveguide with an optical coupler switch to effect the multiplexing would be classified in this subclass.

(2) Note. Optical Time Slot interchange is excluded from this class. See search note below for scrambling a signal of any energy type.

(3) Note. Since optical demultiplex communication would often require the use of a photocell to convert the optical signal to an electrical signal, the demultiplexing is often done electrically, which is excluded from this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:
7, for fault recovery in a WDM system.
14, for testing of a WDM system.
34, for determination of a communication parameter.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclass 870.28 for telemetering via radiant energy beam.

348, Television, subclass 343 for camera optical multiplexing.

359, Optics: Systems and Elements, subclasses 618 through 639 for single channel simultaneously to or from plural channels (e.g., light dividing, combining, or plural image forming, etc.).

370, Multiplex Communication, appropriate subclasses for electrical multiplexing and demultiplexing.

380, Cryptography, subclass 36 for time segment interchange wherein slot portions of the signal are interchanged prior to transmission in order to scramble the signal.

385, Optical Waveguides, subclass 16 for the combination of a waveguide and switch not included in an optical communication system.

44 Mode:

This subclass is indented under subclass 43.
Subject matter wherein individual light beam is applied to an optical cable at a distinctive angle such as the individual light beam can be distinguish when more than one light beam are applied to the cable simultaneously.

45 Optical switching:

This subclass is indented under subclass 43.
Subject matter wherein switching of multiple information or signals takes place in optical domain.

SEE OR SEARCH CLASS:

385, Optical Waveguides, subclasses 16 through 23 for the combination of a waveguide and switch not included in an optical communication system.

46 Hybrid:

This subclass is indented under subclass 45.
Subject matter wherein the optical switching of multiple information or signals is organized to involve a combination of different types of switching operations in time, wavelength, or space.

SEE OR SEARCH CLASS:

370, Multiplex Communications, subclasses 369 through 372 for nonoptical hybrid switching.

47 Time and wavelength:

This subclass is indented under subclass 46.
Subject matter including a wavelength time division multiplexed optical switching system in which optical signals are multiplexed both in time and wavelength domains to provide switching between time slots and between wavelengths.

48 Wavelength:

This subclass is indented under subclass 45.
Subject matter wherein the optical switching operation involves switching of wavelength division multiplexed (WDM) channels or signals based on their wavelengths.

49 Router:

This subclass is indented under subclass 48.
Subject matter including a wavelength router having a routing mechanism by which a set of wavelengths from any input are routed to any output.

(1) Note. The routing mechanism can either be static in which the wavelengths are routed using a fixed configuration or be dynamic in which the wavelength paths can be reconfigured.

50 Crossconnect:

This subclass is indented under subclass 48.
Subject matter including a crossconnect unit by which any wavelength of optical wavelength multiplexed signals is connect from any input to any output.

(1) Note. The crossconnect involves dynamic wavelength routing.

51 Including photonic packet switching:

This subclass is indented under subclass 48.
Subject matter wherein wavelength multiplexed signals are organized into optical packets including a payload portion carrying information data and an address portion by which the optical packets are optically switched to a specific destination.

(1) Note. This subclass is limited to optical packet switching only, for non-optical packet switching, see search note below.

SEE OR SEARCH CLASS:
370, Multiplexing Communications, appropriate subclasses.

52 Time:
This subclass is indented under subclass 45. Subject matter wherein an input light beam is optically directed to selected outputs in order to accomplish time division optical multiplexing.

53 Including delay:
This subclass is indented under subclass 52. Subject matter wherein the time division optical switching is accomplished by the use of some delay of the input light beam.

54 Including photonic packet switching:
This subclass is indented under subclass 52. Subject matter wherein optical time division multiplexed signals are organized into optical packets including a payload portion carrying information data and an address portion by which the optical packets are optically switched to a specific destination.

(1) Note. This subclass is limited to optical packet switching only. See Search note below for nonoptical packet switching.

SEE OR SEARCH CLASS:
370, Multiplexing Communications, appropriate subclasses.

55 Space:
This subclass is indented under subclass 45. Subject matter wherein multiple information beams are separated by the use of a switch to selectively direct individual information portions of a light beam to either separate individual light conductive elements or separate directions in space.

(1) Note. This subject matter may include a waveguide with a switch as a subcombination thereof. See search note below for specific waveguide.

(2) Note. For an optical communication as in this subclass or the indents thereunder combined with a particular claimed sensor, see search note below.

SEE OR SEARCH CLASS:
340, Communications, subclass 553 for indicating system responsive to intruder disturbing stationary electromagnetic waves, subclasses 853.1-856.4 for wellbore telemetering or control; subclasses 870.28-870.29 for telemetering in combination with the type of sensing.
370, Multiplex Communications, appropriate subclasses for a nonoptical bus transmission local area network having token passing, loop or ring, etc.
385, Optical Waveguides, subclass 16 for the combination of a waveguide and switch not included in an optical communications system.

56 Cross Connect:
This subclass is indented under subclass 55. Subject matter wherein space division switches which operates on the basis of the spatial locations of their input are used in signal routing.

57 Path finding or path routing:
This subclass is indented under subclass 55. Subject matter wherein a suitable signal path is determined from the input to the output of the switching network.

58 Optical local area network (LAN):
This subclass is indented under subclass 43. Subject matter wherein multiple optical stations are interconnected via a network of fiber optics to enable transmission and reception between the stations.

SEE OR SEARCH CLASS:
370, Multiplex Communication, appropriate subclasses for LAN.
385, Optical Waveguides, appropriate subclasses for the fibers themselves without the optical multiplex communication environment.

59 Ring or Loop:
This subclass is indented under subclass 58. Subject matter wherein the local area network consists of a series of stations connected to each other and the last station is connected to the first station.

SEE OR SEARCH CLASS:

370, Multiplex Communications, appropriate subclasses, particularly subclass 222 for fault recovery of a ring or loop network, subclass 258 for network configuration determination in a ring system, subclasses 403-405 and 406 for packet switching in a ring network, and subclasses 452-456 for channel assignment by polling on a ring network.

60 Bus:

This subclass is indented under subclass 58.
Subject matter wherein the local area network consists of a series of stations connected in common along a single fiber optic link through the use of optical taps.

SEE OR SEARCH CLASS:

370, Multiplex Communications, appropriate subclasses, particularly subclasses 257 through 258 for network configuration determination in a bus system, and subclasses 451-456 for channel assignment techniques by polling for idle or busy channels connected on a bus.

61 Active star:

This subclass is indented under subclass 58.
Subject matter wherein an optical data distribution system, containing a common node connected to one end of each of three or more branches and the other end of the branches are connected to each member of a local area network multiplex system, permits optical information flow between all of the members; and each member receives its power (i.e., active) from the received optical signals.

(1) Note. A collision detection device in a star has its own power supply yet the incoming optical signals are not converted to electrical energy would be classified in this subclass.

(2) Note. Incoming optical signals which become the source of power within the star for all terminals as a result of conversion into electrical signals would be classified in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

63, for passive star local area networks (LAN's).

62 Repeater:

This subclass is indented under subclass 61.
Subject matter wherein an optical data distribution system contains a common node connected to one end of each of three or more branches and the other end of the branches are connected to appropriate elements of an optical repeater.

SEE OR SEARCH THIS CLASS, SUBCLASS:

64, for a repeater in passive star local area networks (LAN's).

63 Passive star:

This subclass is indented under subclass 58.
Subject matter wherein an optical data distribution system, containing a common node connected to one end of each of three or more branches and the other end of the branches are connected to each member of a local area network multiplex system, permits optical information flow between all of the members; and each member has its own power supply (i.e., passive) and does not change the power of the optical signals it receives from each member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

61, for active star local area networks (LAN's).

64 Repeater:

This subclass is indented under subclass 63.
Subject matter wherein an optical data distribution system contains a common node connected to one end of each of three or more branches and the other end of the branches are connected to appropriate elements of an optical repeater.

SEE OR SEARCH THIS CLASS, SUBCLASS:

62, for a repeater in active star local area networks (LAN's).

65 Polarization:
This subclass is indented under subclass 43.
Subject matter wherein multiple optical signals are distinguished from one another by the particular individual signal vibration perpendicular to the ray direction of travel.

(1) Note. The vibrations are straight lines, circles, or ellipses which produce, respectively, plane, circular or elliptical polarization.

(2) Note. The light waves are modulated by altering the polarization (relative to a reference) in accordance with the information signal.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclass 246 for electro-optical modulation of polarized light, subclass 281 for magneto-optical modulation of polarized light, subclass 301 for light wavedirectional modulation acting on polarized light, and subclass 483 for polarization without modulation.

66 Broadcast and distribution system:
This subclass is indented under subclass 43.
Subject matter wherein a network system broadcast or distribute multiplexed signals to a group of subscribers.

SEE OR SEARCH CLASS:
725, Interactive Video Distribution Systems, subclass 129 for video distribution with hybrid coax/waveguide cables.

67 Bidirectional:
This subclass is indented under subclass 66.
Subject matter wherein two- way transmission and reception of signals is conducted between the subscribers and a broadcasting station.

68 WDM:
This subclass is indented under subclass 66.
Subject matter wherein a multichannel wavelength division multiplexed signal is broadcast or distributed to a group of subscribers in which a receiver selects each channel through demultiplexing.

69 With variable frequency channel assignment:
This subclass is indented under subclass 68.
Subject matter wherein a channel is not limited to a fixed frequency.

70 Hub or central office:
This subclass is indented under subclass 68.
Subject matter including means that provides centralized functions such as switching between connected circuits or connecting subscribers to each other.

71 Including subscribers:
This subclass is indented under subclass 70.
Subject matter including distribution to the ultimate user or customer.

72 Bi-directional:
This subclass is indented under subclass 71.
Subject matter wherein communication between the hub or central station and the subscribers is two way.

73 Bus:
This subclass is indented under subclass 68.
Subject matter wherein the system consists of a series of stations connected in common along a single fiber optic link through the use of optical taps.

74 Hybrid:
This subclass is indented under subclass 43.
Subject matter wherein two or more multiplexing schemes are combined to transmit information.

SEE OR SEARCH CLASS:
725, Interactive Video Distribution Systems, subclass 129 for video distribution with hybrid coax/waveguide cables.

75 Time and wavelength division:
This subclass is indented under subclass 74.
Subject matter wherein information is transmitted on different segments of transmission medium which segments are divided based upon the frequency spectrum and discrete time intervals.

SEE OR SEARCH THIS CLASS, SUBCLASS:

79, for wavelength division multiplexing only.

98, for time division multiplexing only.

76 Subcarrier multiplexing:

This subclass is indented under subclass 43.

Subject matter wherein a number of base band analog or digital signals are first frequency division multiplexed using local oscillators of different radio frequencies and then combined to drive a high speed light source.

77 Code division multiplexing:

This subclass is indented under subclass 43.

Subject matter including a spread spectrum technique in which each channel is coded in a manner that its spectrum spreads over a much wider region than that of occupied by an original signal.

78 Multiple Access (e.g., CDMA):

This subclass is indented under subclass 77.

Subject matter wherein user is allowed to access any shared channel randomly at an arbitrary time.

79 Wavelength division or frequency division (e.g., Raman, Brillouin, etc.):

This subclass is indented under subclass 43.

Subject matter wherein 1) two or more optical information signals simultaneously present on a common optical waveguide are differentiated by optical wavelength or 2) the frequency spectrum of an optical transmission medium is divided into segments and respective information channels are transmitted in different segments.

(1) Note. Waveguide division multiplexing is identified as WDM.

(2) Note. Different segments need not be associated on a one-to-one basis with the information channels.

(3) Note. This subclass includes waveguide with an input-output coupler as a subcombination thereof. See also Search Class note.

(4) Note. Simulated Raman effect is the amplification, build up strongly and generally exhibiting the characteristic of stimulated emission of the small portion of light that is scattered in random directions when a monochromatic light beam of high intensity is transmitted through matter.

(5) Note. This subclass includes Brillouin-type nonlinear optical device having frequency-shifted radiation with optical multiplexing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

42, for optical transceiver wavelength duplex in which two optical beams having different wavelengths are transmitted in opposite directions in the same medium.

75, for time and wavelength division.

132, for photophone wherein an audio signal is directly modulated onto a light beam.

SEE OR SEARCH CLASS:

327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for Raman type frequency translator per se.

359, Optical: Systems and Elements, subclass 634 for wavelength selective (e.g., dichroic mirror, etc.).

370, Multiplex Communication, appropriate subclasses, particularly subclasses 281 and 295 for frequency division in wireless or wired nonoptical multiplex communication systems, respectively.

385, Optical Waveguides, subclass 24 for wavelength division multiplexer or demultiplexer structure that does not involve communication.

80 Soliton:

This subclass is indented under subclass 79.

Subject matter wherein very narrow pulses that maintain their shape over long distance are multiplexed for undistorted propagation over an optical fiber.

SEE OR SEARCH THIS CLASS, SUBCLASS:
146, for soliton transmission in a transmitter and receiver system.
179, for soliton transmission in a optical repeater system.

81 Dispersion compensation:
This subclass is indented under subclass 79. Subject matter wherein smeared signals due to different group velocities in an optical fiber are compensated.

SEE OR SEARCH THIS CLASS, SUBCLASS:
147, for dispersion compensation in a transmitter and receiver system.

82 By optical coupling:
This subclass is indented under subclass 79. Subject matter wherein multiplexing is accomplished by optical device which permits the transfer of light from one element to another.

(1) Note. The combination of an optical coupler or input-output coupler and wavelength division or frequency division optical communication system is classified in this subclass.

SEE OR SEARCH CLASS:
385, Optical Waveguides, subclasses 15 and 31 for optical coupler and input output coupler not included in an optical communication system.

83 Add or drop:
This subclass is indented under subclass 82. Subject matter wherein desired wavelengths are inserted or extracted at a desired location.

(1) Note. A pure add or drop structure not involving communication is classified in Class 385.

84 Grating:
This subclass is indented under subclass 83. Subject matter comprising an add or drop multiplexer in which signal is either multiplexed or demultiplexed with a grating.

85 Filter:
This subclass is indented under subclass 83. Subject matter comprising add or drop multiplexer in which signal is either multiplexed or demultiplexed with a filter.

86 Prism:
This subclass is indented under subclass 82. Subject matter wherein a beam is coupled in or out of a waveguide by one or more transparent bodies bounded in part by two plane surfaces that are angularly related (i.e., not parallel) to accomplish a desired multiplexing.

(1) Note. At least one of the surfaces being internally reflecting or refracting for impinging incident light.

(2) Note. This subclass includes the combination of a prism and wavelength or frequency division optical communication system.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclass 831 for prisms per se.
385, Optical Waveguides, subclass 36 for prism coupling not included in an optical communication system.

87 Grating:
This subclass is indented under subclass 82. Subject matter wherein 1) a beam is coupled in or out of a waveguide to accomplish a desired multiplexing by narrow parallel slits in a plate or 2) narrow parallel reflecting surfaces made by ruling grooves on polished metal break up the light waves as they emerge.

(1) Note. This subclass includes a combination of a grating and wavelength division or frequency division optical communication system. See search note for waveguide per se.

SEE OR SEARCH CLASS:
385, Optical Waveguides, subclass 37 for a grating coupling not included in an optical communication system.

88 Lens:
This subclass is indented under subclass 82. Subject matter wherein a beam is coupled in or

out of a waveguide by transparent optical component consisting of one or more pieces of optical glass with the surface so curved to converge or diverge transmitted rays to accomplish a desired multiplexing.

(1) Note. This subclass includes combination of a lens and wavelength division or frequency division optical communication system.

SEE OR SEARCH CLASS:
385, Optical Waveguides, subclass 33 for lens coupling not included in an optical communication system.

89 Multiple Access (e.g., WDMA):
This subclass is indented under subclass 79. Subject matter wherein access to multiple channels on different wavelengths on a same fiber optic cable is provided.

90 Electrically controlled single source:
This subclass is indented under subclass 79. Subject matter wherein a single source of light is either wavelength division or frequency division optical multiplexed via an external electrical control signal.

91 Different sources:
This subclass is indented under subclass 79. Subject matter wherein each channel of a common optical waveguide is supplied with data from separate origins of light.

92 Including pumping:
This subclass is indented under subclass 91. Subject matter wherein the atoms in at least one of the source of a medium are caused to raise from certain lower to certain higher energy level to cause population inversion between certain intermediate levels in order to ultimately produce photons when the energy level moves from a higher to a lower level.

SEE OR SEARCH THIS CLASS, SUBCLASS:
157, for pumping in an optical transmitter and receiver system.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclass 345 for a particular pumping type in an optical amplifier.
372, Coherent Light Generators, subclass 69 for a particular pumping type which is not used for amplification of a light beam input.

93 Including feedback:
This subclass is indented under subclass 79. Subject matter wherein a portion of an output signal is used to control a desired parameter in the WDM system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
195, for a transmitter including feedback.

94 Power control:
This subclass is indented under subclass 93. Subject matter wherein power of a light source is controlled through a feedback scheme.

SEE OR SEARCH THIS CLASS, SUBCLASS:
15, for power control in response to a fault.
38, for power parameter determination.
94, for feedback power control in a multiplexing wavelength division or frequency division.
120, for power compensation in a free space optical communication system.
197, for feed back power compensation in a transmitter.

95 Wavelength control:
This subclass is indented under subclass 93. Subject matter wherein wavelength of a light source is controlled through a feedback scheme.

SEE OR SEARCH THIS CLASS, SUBCLASS:
196, for wavelength control of a transmitter.

96 Through free space:
This subclass is indented under subclass 79. Subject matter wherein multiplexed information is transmitted wirelessly or through the atmosphere.

SEE OR SEARCH THIS CLASS, SUBCLASS:
118 through 131, for free space optical communication.

103, for time division multiplexing through free space.

97 Repeater:
This subclass is indented under subclass 79. Subject matter wherein the transmitted signal is received and regenerated.

98 Time division:
This subclass is indented under subclass 43. Subject matter wherein access to opt ical transmission medium is divided into discrete time intervals and information from respective channels is transmitted in differing time intervals.

(1) Note. Differing time intervals need not be associated on a one-to-one basis with the information chan nels.

SEE OR SEARCH THIS CLASS, SUBCLASS:
8, for fault recovery in a TDM system.
35, for determination of a communication parameter in a TDM system.

SEE OR SEARCH CLASS:
370, Multiplex Communications, appropriate subclasses, particularly subclasses 280 and 294 for time division in wireless or wired nonoptical duplex systems, respectively, and subclasses 345-350 and 498-545 for time division in wireless or wired nonoptical multiplex communication systems, respectively.

99 Multiple access (e.g., TDMA, CSMA):
This subclass is indented under subclass 98. Subject matter wherein stations use a protocol to obtain access of a channel before sending a packet of information.

(1) Note. Frequently, CSMA networ k has a collision detection capability in which the transmission is immediately terminated when a collision of opposing carrier signal is detected.

SEE OR SEARCH CLASS:
370, Multiplexed Communications, appropriate subclasses, particularly subclasses 319 and 329-337, 342, 344, and 347-348 for multiple accesses in wireless communications, and subclasses 431-463 for multiple accesses in wired communications.

100 Subscriber system:
This subclass is indented under subclass 98. Subject matter wherein the system is developed to commu nicate with prearranged plural time division multiplexed stations thus enabling all preselected stations to receive identified information at the same time it is transmitted.

(1) Note. The se systems transmit data without any coding, but the data itself identifies specific stations that are to receive transmitted data.

SEE OR SEARCH CLASS:
379, Telephonic Communications, appropriate subclasses for nonoptical subscriber checking.
380, Cryptography, appropriate subclasses for coding of the information signal to prevent unauthorized users from receiving information.

101 By specific optical element:
This subclass is indented under subclass 98. Subject matter wherein specific optical elements derive multiple channel on a single transmission facility by connecting bit stream one at a time at regular intervals.

102 Including delay:
This subclass is indented under subclass 98. Subject matter wherein the time division optical multiplexing is accomplished by the use of a delay of an input light beam.

103 Through free space:
This subclass is indented under subclass 98. Subject matter wherein the multiplexed information is transmitted wirelessly or through the atmosphere.

SEE OR SEARCH THIS CLASS, SUBCLASS:
118 through 131, for free space optical communication.
96, for wavelength division, time division multiplexing through free space.

104 UNDERWATER:
This subclass is indented under the class definition. Subject matter wherein optical communication is performed via a light beam actually traveling through the water.

(1) Note. The underwater optica l communication can be used by underwater divers or in underwater repeater.

SEE OR SEARCH CLASS:
116, Signals or Indicators, subclass 27 for devices includes means for the mechanical production and reception of sound-vibrations transmitted through bodie s of water.
340, Communications: Electrical, subclasses 850 through 852 for a generic underwater communication system.
367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 131 through 134 for underwater acoustic communications systems.

105 C able repeater:
This subclass is indented under subclass 104. Subject matter comprising details of an optoelectronic device or module to retransmit a received signal.

(1) Note. For a digital optical communication system, the received signal is usually reshaped, or reconstructed bef ore it is retransmitted.

106 REMOTE CONTROL:
This subclass is indented under the class definition. Subject matter including a transmitter for transmitting a control signal modulated by a variable device via an optical communication link, and a receiver for receiving the control signa l to control a remote electrically operated device coupled to the receiver.

(1) Note. The devices exclude devices solely for making information or intelligence perceptible to an individual.

(2) Note. Optical signal control devices for particular or bro adly recited art devices are classified in this subclass unless there is provision for this combination in the art devices.

(3) Note. Optical signal control devices for particular art devices are classified with the art device if the features thereof a re particularly recited.

(4) Note. Optical telemetry with a specific sensor used in a particular environment is excluded from this subclass. See Search notes below.

SEE OR SEARCH CLASS:
330, Amplifiers, subclass 59 for electrical amplifiers combined w ith a nonmodulated light controlled or activated device that is not part of the amplifying device.
334, Tuners, subclass 8 for remotely controlled tuners.
340, Communications: Electrical, subclasses 853.1 through 856.4 for wellbore telemetry including any type of radiant energy (i.e., optical, radio), subclasses 870.28-870.38 for generic communication system having an optical data link in combination with a specific sensor.
348, Television, subclass 734 for remote control of a television receiver.
367, Commun ication, Electrical Acoustic Wave Systems a nd Devices, subclass 133 for remote control of an underwater acoustic communication system, and subclass 197 for remote control in an acoustic communication system.
379, Telephonic Communications, subclasses 74 through 77 for remote control over a telephone line.
455, Telecommunications, subclasses 151.1 through 153.2 for analog modulated carrier wave receivers with remote control of receiver tuning.

107 Bi directional (i.e., monitoring or acknowledge):
This subclass is indented under subclass 106. Subject matter wherein a) the receiver receives a response from the remote electrically operated device indicating that the control signal was received or (2) the transmitter monitors the remote electrically operated device.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclass 503 for an electrical ring back acknowledgement condition responsive indicating system and subclass 825.06 for electrical monitoring or control.

108 Interrogator system:

This subclass is indented under subclass 107. Subject matter wherein the t ransmitter sends a signal requesting a response from the receiver.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclasses 10.1 through 10.6 for interrogation response in a selective communication system

342, Communications: Directive Radio Wave Syst ems and Devices (e.g., Radar, Radio Navigation), subclasses 42 through 51 for transponder system using radar.

109 In industrial or hazardous environment:

This subclass is indented under subclass 106. Subject matter wherein the remote electrically operated device is a) a machine tool or b) is located in a dangerous environment.

(1) Note. In such environment robots are used where it is dangerous for humans.

(2) Note. Such environment includes, for example, an area where stray capacitance from radio frequencies would cause explosions.

SEE OR SEARCH CLASS:

700, Data Processing: Generic Control Systems or Specific Applications, subclasses 159 through 195 for a machine tool data processing control system.

901, Robots (Cross-Reference Art Collections), subclass 47 for optical sensing device.

110 Through optical fiber or waveguide:

This subclass is indented under subclass 109. Subject matter wherein the optical communication link includes a) a single or bundle of fiber used as a single transmission medium to propagate optical energy or b) a system of material designed to confine direct optical waves in a direction determined by its physical boundary.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for fault detection of an optical fiber.

13, for fault location in an optical fiber or waveguide.

113, for remote control system through optical fiber or waveguide.

116, for hybrid communication system including optical fiber.

141, for transmitter and receiver system including optical waveguide, and subclass 142 for specific type of fiber.

139, for optical transceiver including optical fiber or waveguide.

178, for optical repeater including optical waveguide.

200, for transmitter including optical waveguide.

214, for opt ical receiver with optical wave guide.

111 Switching:

This subclass is indented under subclass 106. Subject matter comprising switching means to selectively initiate or change a state of a remote control.

112 Plural:

This subclass is indented under subclass 106. Subject matter wherein (a) a plurality of devices or (b) a plurality of functions or accessories of a device is remotely controlled.

(1) Note. This subclass includes universal remote control.

113 Through optical fiber or waveguide:

This subclass is indented under subclass 106. Subject matter wherein the optical communication link includes a) a single or bundle of fiber used as a single transmission medium to propagate optical energy or b) a system of material designed to confine direct optical waves in a direction determined by its physical boundary.

SEE OR SEARCH THIS CLASS, SUBCLASS:

110, for remote control in industrial environment or hazardous environment through optical fi ber or waveguide.
20, for fault detection of an optical fiber.
13, for fault location in an optical fiber or waveguide.
116, for remote control including optical fiber.
141, for transmitter and receiver system including optical waveguide, and subclass N3 for specific type of fiber.
139, for optical transceiver including optical fiber or waveguide.
178, for optical repeater including optical waveguide.
200, for transmitter including optical waveguide.
214, for an optical receiver with optical wav e guide.

114 Rotating part:

This subclass is indented under subclass 106. Subject matter wherein the transmitter or the receiver is mounted on a rotating device.

115 HYBRID COMMUNICATION SYSTEM (E.G., OPTICAL AND RF):

This subclass is indented under the class definition. Subject matter including converting me ans adapted for t ransmission and reception of signal data in different energy forms (e.g., electrical and optical energy).

(1) Note. Electrical signal data includes, for example, digital sound signal, radio frequency signal etc.

SEE OR SEARCH CLASS:

725, Interactive Video Distribution Systems, subclass 129 for video distribution with hybrid coax/waveguide cables.

116 Including specific optical interface:

This subclass is indented under subclass 115. Subject matter including details of an optical interface module comprising optic al communication component for transmission of signal.

(1) Note. The details includes, for example, cable, fiber optic, optical channel, waveguide, light guides etc. for transmission of signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for fault detection of an optical fiber.
13, for fault location in an optical fiber or waveguide.
116, for remote control including optical fiber.
134, for a photophone transducer including optical fiber or waveguide.
141, for transmitter and receiver system including optical waveguide, and subclass N3 for specific type of fiber.
139, for optical transceiver including optical fiber or waveguide.
178, for optical repeater including optical waveguide.
200, for transmitter including optical waveguide.
214, for optical waveguide in an optical receiver.

117 Housing and Mounting:

This subclass is indented under subclass 116. Subject matter including means for supporting or enclosing the optical interface module.

118 OPTICAL COMMUNICATION OVER FREE SPACE:

Subject matter under c lass definition wherein a signal carrying optical beam is propagated over air during which the beam is not spatially confined in any optical component or medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:

96, for multiplexing wavelength division or frequency division through free space.

119 Compensation:

This subclass is indented under subclass 118. Subject matter including means for correcting a signal distortion due to either system components or changes in atmospheric transmission medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:

136, for compensation in an optical transceiver.

147 through 148, for dispersion compensation in a transmitter and receiver system.
158, for compensation in a transmitter and receiver system
192, for compensation in an optical transmitter.
208, for post compensation in an optical receiver.

120 Power-control:
This subclass is indented under subclass 119.
Subject matter wherein the signal distortion is compensated by controlling a power supply.

SEE OR SEARCH THIS CLASS, SUBCLASS:
38, for power parameter determination in an optical communication system.
15, for power control in response to a fault.
94, for feedback power control in a multiplexing wavelength division or frequency division.
120, for power compensation in a free space optical communication system.
197, for feed back power compensation in a transmitter.

121 Satellite system:
This subclass is indented under subclass 118.
Subject matter wherein the optical beam is propagated to or from at least a moving high attitude object at a great distance from the earth.

122 Including alignment:
This subclass is indented under subclass 121.
Subject matter including means for controlling the alignment between two moving objects or between the moving object and a station on earth to ensure a prope r incident of a transmitted beam upon a receiving end for a reception of useful information.

(1) Note. Means for controlling the alignment includes, for example, means for adjusting direction of communication, focus checking and control means, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
129, for alignment between two transceivers.
131, for alignment between a transmitter and a receiver.

123 Feedback control:
This subclass is indented under subclass 122.
Subject matter including means for returning at least a portion of an output obtained at the receiving end to the controlling means to achieve a desired effect.

124 Space to space:
This subclass is indented under subclass 121.
Subject matter wherein the optical beam is propagated between two moving high attitude objects such as satellites or spacecrafts.

125 Space to ground or ground to space:
This subclass is indented under subclass 121.
Subject matter wherein the optical beam is propagated between a moving high attitude object such as a satellite or a spacecraft and a station on earth.

126 Specific repeater:
This subclass is indented under subclass 118.
Subject matter under ... including details of a repeater having at least the receiver and the transmitter sections to receive and send optical beam in free space.

SEE OR SEARCH THIS CLASS, SUBCLASS:
173 through 181, for an optical repeater system.

127 In an office en vironment:
This subclass is indented under subclass 118.
Subject matter wherein the optical beam is communicated in free space between communication devices located within a enclosed area (e.g., in-building communication).

(1) Note. This subclasses includes, for example, communic ation between master and slave machines.

128 Transceivers:
This subclass is indented under subclass 118.
Subject matter wherein the optical beam is propagated between two transceivers.

SEE OR SEARCH THIS CLASS, SUBCLASS:
135 through 139, for an optical transceiver.

129 Including alignment:
This subclass is indented under subclass 128. Subject matter including means for controlling the alignment between the transceivers to ensure a proper incident of a transmitted beam upon a receiving end for a reception of useful information.

(1) Note. Means fo r controlling the alignment includes, for example, means for adjusting direction of communication, focus checking and control means, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
122, for alignment between satellites or aircrafts.
131, for alignment between a transmitter and a receiver.

130 Transmitter and receiver:
This subclass is indented under subclass 118. Subject matter wherein the optical beam is propagated between a transmitter and a receiver.

SEE OR SEARCH THIS CLASS, SUBCLASS:
140 through 172, for a transmitter and receiver sys tem.

131 Including alignment:
This subclass is indented under subclass 130. Subject matter including means for controlling the alignment between the transmitter and the receiver to ensure a proper incident of a transmitted beam upon a receiving end for a reception of useful inform ation.

(1) Note. Means for controlling the alignment includes, for example, means for adjusting direction of communication, focus checking and control means, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
122, for alignment between satellites or aircrafts.
129, for alignment between two transceivers.

132 PHOTOPHONE:
This subclass is indented under the class definition. Subject matter wherein an audio signal, as an information signal, is directly modulated onto a light beam.

(1) Note. This subclass includes direct modulation of the l ight beam by a sound responsive mechanical device (e.g., a diaphragm).

(2) Note. This subclass includes optical telephones which require the use of an optical carrier for communication information.

SEE OR SEARCH CLASS:
379, Telephonic Communications, subclasses 56.1-56.3 for a light wave link for speech or a paging signal. which include optical telephones where connection is made through a telephone operator or exchange.

133 Specific transducer:
This subclass is indented under subclass 132. Subject matter including details of a light energy converting means device which converts an optical modulated light beam to a non-optical energy signal (e.g., acoustic, electrical) are specified.

134 Including optical fiber or waveguide:
This subclass is indented under subclass 133. Subject matter wherein the transdu cer either is connected to or contains (a) a single or bundle of fiber used as a single transmission medium to propagate optical energy or (b) a system of material designed to confine direct optical waves in a direction determined by its physical boundary.

(1) Note. An optical fiber or wave guide produces total internal confinement of an optical beam.

SEE OR SEARCH THIS CLASS, SUBCLASS:
20, for fault detection of an optical fiber.
13, for fault location in an optical fiber or waveguide.

110, for remote control system in an industrial or hazardous environment through optical fiber or waveguide
113, for remote control system through optical fiber or waveguide.
116, for hybrid communication system including optical fiber.
141, for transmitter and receiver system including optical waveguide, and subclass 142 for specific type of fiber.
139, for optical transceiver including optical fiber or waveguide.
178, for optical repeater including optical waveguide.
200, for transmitter including optical waveguide.

SEE OR SEARCH CLASS:
385, Optical Waveguides, appropriate subclasses for optical fiber or waveguides, per se.

135 OPTICAL TRANSCEIVER:
This subclass is indented under the class definition. Subject matter wherein an optical transmitter and a receiver are at a common location for transmission and reception of separate optical signals in such a manner that an optical signal is transmitted using some of the same equipment used for the reception of another optical signal.

(1) Note. The optical transmitter and receiver are usually confined to a common housing in a transceiver and termed "a station".

(2) Note. The simultaneous separation of a transmitter and receiver is a duplex operation and is excluded from this subclass, See search note below.

SEE OR SEARCH THIS CLASS, SUBCLASS:
22, for testing of an optical transceiver.
35 through 139, for optical transceivers in an optical communication system.
41, for a duplexer which uses a single transmission line to both transmit and receive.
140 through 172, for an optical transmitter and receiver system in an optical communication system.
165 through 167, for plural stations having the transmitter and receiver in different housings and location s.
173 through 181, for an optical repeater communication system.
182 through 201, for an optical transmitter in an optical communication system.
202 through 214, for an optical receiver in an optical communication system.

SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems a nd Devices, subclasses 728 through 747 for the electrical components that are separately housed in a container or supported in a unit or packaging scheme displaying regularity and separable repetition.

136 Including compensation:
This subclass is indented under subclass 135. Su bject matter including means for correcting or modifying a system operation condition or a data signal error due to either an internal or an external effect.

(1) Note. This subclass includes, for example, clock recovery, phase adjustme nt, astigmatic correction, noise reduction; temperature calibration, parasitic effects compensation, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for compensation in a free space optical communication system.
147 through 148, for dispersion compensation in an optical transmitter and receiver system.
158, for compensation in an optical transmitter and receiver system.
192, for compensation in an optical transmitter.
208 through 211, for post compensation in an optical receiver.

137 Including feedback:
This subclass is indented under subclass 135. Subject mat ter wherein a portion of a received signal is used to control the optical transmitter or receiver.

SEE OR SEARCH THIS CLASS, SUBCLASS:

195, for feedback compensation in an optical transmitter.

213, for feedback control of optical elem ents in a receiver.

209, for feed back control for post compensation in an optical receiver.

138 Single device as transmitter and receiver:

This subclass is indented under subclass 135. Subject matter wherein a same device photodiode or light emitter is used to both transmit or r eceive signal based on how it is biased.

139 Including optical fiber or waveguide:

This subclass is indented under subclass 135. Subject matter including (a) a single or bundle of fiber used as a single transmission medium to propagate optical energy or (b) a system of material designed to confine direct optical waves in a direction determined by its physical boundary.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for fault detection of an optical fiber.

13, for fault location in an optical fiber or waveguide.

110, for remote contro l system in an industrial or hazardous environment through optical fiber or waveguide

113, for remote control system through optical fiber or waveguide.

116, for hybrid communication system including optical fiber.

134, for a photophone transducer including optical fiber or waveguide.

141, for transmitter and receiver system including optical waveguide, particularly N3 for specific type of fiber.

178, for optical repeater including optical waveguide.

200, for transmitter including optical waveguide.

214, for receiver including optical waveguide

140 TRANSMITTER AND RECEIVER SYSTEM:

This subclass is indented under the class definition. Subject matter wherein both the transmitter and receiver are located at separate stations for point-to-point communication from the transmitter at one location to the receiver at another location, remote from the transmitter.

(1) Note. This subclass includes active systems wherein the receiver has its own power source for an optical beam activation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

135 through 139, for optical transceivers in an optical communication system.

173 through 181, for an optical repeater communication system.

182 through 201, for an optical transmitter in an optical communication system.

202 through 214, for an optical receiver in an optical communication system.

141 Including optical wave guide:

This subclass is indented under subclass 140. Subject matter includes one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another within the confines of the ir outer surface by means of internal reflections or modal transmission.

(1) Note. An optical waveguide requires total internal reflection.

(2) Note. This subject matter includes an optical waveguide in combination with an optical transmitter and rece iver system. For optical waveguide per se, see search note below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

20, for fault detection of an optical fiber.

13, for fault location in an optical fiber or waveguide.

110, for remote control system in an industrial or hazardous environment through optical fiber or waveguide.

113, for remote control system through optical fiber or waveg uide.

116, for hybrid communication system including optical fiber.

134, for a photophone transducer including optical fiber or waveguide.

139, for optical transceiver including optical fiber or waveguide.

178, for optical repeater including optical wav eguide.
200, for transmitter including optical waveguide.
214, for receiver including optical waveguide

SEE OR SEARCH CLASS:
250, Radiant Energy, subclasses 227.11 through 227.32 for photocell control that could be optical communication type modulator.
324, Electricity: Measuring and Testing, subclass 95 for measuring, testing, or sensing electricity, per se, with waveguide or long line.
385, Optical Waveguides, appropriate subclasses for optical waveguide structure, per se.

142 Specific type of fiber or waveguide:
This subclass is indented under subclass 141. Subject matter including details of the fiber or waveguide.

143 Multimode:
Subject matter under 142 wherein the fiber includes core measured about 50-200 microns in diameter for allowing light pulses to zigzag along many different paths.

144 Monomode:
This subclass is indented under subclass 142. Subject matter wherein the fiber includes core measured about 10 m icrons in diameter for allowing light pulses to travel in a single path.

145 Redundant fibers:
This subclass is indented under subclass 142. Subject matter including a first and a second optical fiber means in order to ensure that a signal is received.

146 Soliton:
This subclass is indented under subclass 141. Subject matter wherein a narrow pulse of light that retains its shape as it travels long distance along the fiber is used in the transmitter and receiver system.

147 Dispersion compensation:
This subclass is indented under subclass 141. Subject matter comprises means for cor recting or reducing distortion induced by (a) scattering in a light beam as it travels along the fiber or (b) overlapping of a light signal on one wavelength to different wavelengths because of reflected ray and different refractive index of fiber material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for compensation in an optical communication over free space.
136, for compensation in an optical transceiver.
158, for compensation in a transmitter and receiver system.
192, for compensation in an optical transmitter.
208, for post compensation in an optical receiver.

148 Using dispersion compensation optical fiber (e.g., DCOF):
This subclass is indented under subclass 147. Subject matter wherein correction fiber of specified length and amount or dispersion is used for compensatio n purpose.

149 Using equalizing filter (e.g., interferometer, grating):
This subclass is indented under subclass 147. Subject matter wherein optical filter is used for compensation purpose.

150 Using optical phase conjugation:
This subclass is indented under subclass 147. Subject matter wherein an optica l phase conjugation for the transmitted light waves is generated for compensation purpose.

151 Presence detection:
This subclass is indented under subclass 140. Subject matter wherein an optical transmitter and receiver system used for communications is also used to determine if an object is present within the range of the transmitted light waves.

SEE OR SEARCH CLASS:
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), for pertinent subclass(es) as determined by schedule review.
356, Optics: Measuring and Testing, subclasses 3 through 22 for range or remote distance (e.g., height) finding,

which is useful in identifying the actual location of an object.

152 Including polarization:
This subclass is indented under subclass 140. Subject matter wherein the vibrations of an optical beam in the communication system is controlled.

(1) Note. The se vibrations are in straight lines (plane polarization), circles (circular polarization), or ellipses (elliptical polarization).

SEE OR SEARCH THIS CLASS, SUBCLASS:
184, for polarization in a transmitter.
205, for polarization in a heterodyne optical r eceiver.

153 One transmitter, plural receivers:
This subclass is indented under subclass 140. Subject matter wherein optical information received at multiple locations is delivered by a single transmitter.

154 Including synchronization:
This subclass is indented under subclass 140. Subject matter wherein all transmitters and receivers operate in the same time frame and their respective clocks are maintained to be at the same time and operating in an identical manner.

155 Clock recovery:
This subclass is indented under subclass 154. Subject matter wherein a clock signal is recover ed from the transmitted light waves.

156 Including alignment between transmitter and receiver:
This subclass is indented under subclass 140. Subject matter including means for controlling the alignment between the transmitter and the receiver to ensure that they are pointing at o ne another to cause a proper incident of the transmitted beam upon a receiving end for a reception of useful information.

SEE OR SEARCH CLASS:
356, Optics: Measuring and Testing, subclasses 138 through 155 for axial alignment which requires measuring to determi ne how to align, but not in an optical communication environment; and subclasses 399-401 for lateral alignment which moves the receiver or transmitter for alignment between the two, but not in an optical communication environment.

157 Including pumping:
This subclass is indented under subclass 140. Subject matter wherein the atoms of a medium at the transmitter or in a fiber or amplifier are caused to be raised from a lower to a higher energy level to cause a population inversion between certain intermediate levels in order to ulti mately produce photons when the energy level moves from higher to lower levels.

(1) Note. This is a form of optical amplification.

SEE OR SEARCH THIS CLASS, SUBCLASS:
92, for a pump in at least one of the plural sources to produce wavelength division o r frequency division multiplex.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclass 345 for a particular pumping type in an optical amplifier.
372, Coherent Light Generators, subclasses 69 through 80 for particular pumping type which is not used for amplification of a light beam input.

158 Including compensation:
This subclass is indented under subclass 140. Subject matter including means for eliminating or reducing from a transmitted response information error that the system would produce.

(1) Note. This compensation is to be effective to eliminate noise, effects of temperature, or any error produced on the information signal as the result of an external or internal effect.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for compensation in an optical communication over f ree space.
136, for compensation in an optical transceiver.

147 through 148, for dispersion compensation in a transmitter and receiver system.
192, for compensation in an optical transmitter.
208, for post compensation in an optical receiver.

159 Reducing d istortion or dispersion:
This subclass is indented under subclass 158. Subject matter wherein the information error is caused by interference of light waves or by scattering or overlapping taking place in a light beam as it travels.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for compensation in an optical communication over free space.
147, for compensation in optical communication when the dispersion is specifically caused by a fiber or waveguide.

160 Using optical amplifier:
This subclass is indented under subclass 158. Subject matter including an opti cal amplifier which compensates an error by increasing or decreasing amplitude of the information signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
333 through 349, for details of an optical amplifier.

161 Using delay:
This subclass is indented under subclass 158. Subject matter including a d elay which compensates an error by delaying at least a part of the information signal.

162 Including feedback from receiver:
This subclass is indented under subclass 140. Subject matter wherein a feedback signal is sent from the receiver to the transmitter for compensation purpose.

163 Including electrical oscillator:
This subclass is indented under subclass 140. Subject matter including a generator of an alternating, a continuous, sinusoidal, or pulsed signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
31, for electrical oscillator, per se.

164 Includ ing optical circuit board:
This subclass is indented under subclass 140. Subject matter wherein the communication takes place in a circuit board which includes an empty bus.

(1) Note. The circuit board is essentially an empty bus with provision for plugging an optical transmitt er and receiver into it.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 107 through 108 for computing by the use of optical beams.

165 Plural stations:
This subclass is indented under subclass 140. Subject matter including at least two spaced apart station s each having a transmitter which communicates with a remote receiver.

(1) Note. Since this subclass requires that a transmitter communicates with a remote receiver, an adjacent transmitter and receiver (i.e., within a single transceiver) do not constitute a spaced apart station.

SEE OR SEARCH THIS CLASS, SUBCLASS:
135 through 139, for optical transceivers where the transmitter and receiver are adjacent one another and within a single housing.

166 Address directing connections:
This subclass is indented under subclass 165. Subject matter wherein the optical beam is directed to a proper station using station destination address information attached to communication data on a same optical beam.

(1) Note. The address is an optical code that identifies which station is to receive the tra nsmitted data.

167 Unidirectional or loopback:
This subclass is indented under subclass 165. Subject matter comprising a plurality of sta-

tions, each having both a transmitter and a receiver, and are serially linked in a manner that the transmitter of a preceding station transmits to the receiver of a next station and the transmitter of the last station transmits to the receiver of the first station.

(1) Note. If one of the stations or lines develops a fault; the last transmitted signal, which is not received by the next station intended for receipt, will be returned to the preceding station so this station knows that the transmitted signal has not been transmitted through the entire system.

167.5 Central or master station:
This subclass is indented under subclass 165. Subject matter wherein a single centr al or master station, having both an optical transmitter and receiver, transmits to all of the stations in the system and also receives responses from all of the stations of the system.

(1) Note. The central or master station can broadcast via optical s ignals or use fiber optic cables to link the transmitted and received optical signals.

(2) Note. The central or master station can be used in an asynchronous system of stations.

168 Passive system:
This subclass is indented under subclass 140. Subject matter wherein the receiver derives its power to activate itself from optical beam transmitted by the transmitter.

(1) Note. The received optical beam is the source for the receiver.

SEE OR SEARCH CLASS:
200, Electricity: Circuit Makers and Breakers, subclass 310 for an electri cal switch together with details of the indicators; Dig. 47 for light guide for indicators.
250, Radiant Energy, subclasses 227.11 through 227.32 for shutter-type optical switches.

169 Retroreflection:
This subclass is indented under subclass 168. Subject matter wherein response to a rec eived optical beam is transmitted in the opposite direction of the received beam to ensure that original transmitter receives the response.

170 Retroreflection:
This subclass is indented under subclass 140. Subject matter wherein response to a received optical beam is transmitted in the opposite direction of the received beam to ensure that original transmitter receives the response.

(1) Note. This subclass is for receiver having active elements.

171 Received signal supplies power distribution to diverse devices:
This subclass is indented under subclass 140. Subject matter wherein the power for operation of devices unrelated to the transmitter and receiver system is obtained from a received optical signal.

172 Including visible light modulation:
This subclass is indented under subclass 140. Subject matter wherein communication i s provided at least partially over a visible light signal.

173 OPTICAL REPEATER SYSTEM
This subclass is indented under the class definition. Subject matter including apparatus for receiving a light wave signal and to reradiating the signal at a same or different carrier frequency.

(1) Note. The recreating or retransmitting signal is usually at a higher energy level or in a desired direction.

(2) Note. This subclass excludes a transmitted signal that has different information content than the received signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
135 through 139, for optical transceivers in an optical communication system.
140 through 172, for an optical transmitter and receiver system in an optical communication system.

182 through 201, for an optical transmitter in an optical communication system.

202 through 214, for an optical receiver in an optical communication system.

SEE OR SEARCH CLASS:

178, Telegraphy, subclass 70R-70TS for repeaters specific to telegraphy.

330, Amplifiers, for amplifier systems in general, particularly subclass 10 for modul ator-demodulator type amplifiers for amplifying direct current or slowly varying alternating current signals.

332, Modulators, subclass 183 for modulation converters for converting one modulated wave to a differently modulated wave (e.g., pulse modulation to frequency modulation or frequency modulation to amplitude modulation); subclass 108 for plural stage modulation systems wherein each stage is of the same or diverse type of modulation, the last stage being of the pulse modulation type; subclasses 11 9 - 122 or 144-148 for plural stage modulation systems wherein the last stage is of the phase or frequency modulation type; and subclasses 151-154 for plural stage modulation systems wherein the last stage is of the amplitude modulation type.

333, Wave Tr ansmission Lines and Networks, subclasses 117 through 123 for hybrid type networks.

340, Communications: Electrical, subclass 291 for signal box repeaters which repeat, for example, signals received at a central station to a plurality of firehouses.

375, Pulse or Digital Communications, subclasses 211 through 215 for repeater for a pulse or digital signal in the radio frequency range.

455, Telecommunications, subclasses 7 through 25 for repeaters for analog signals in the radio frequency range.

174 Demodulating:

This subclass is indented under subclass 173. Subject mat ter wherein the optical repeater extracts the information content of the signal it receives prior to reradiating the signal.

(1) Note. Although there are various reasons for demodulating prior to transmission, the following are example s (a) to enable retransmission with a different modulation, or (b) the demodulation is necessary to determine the reradiated destination for the received signal.

175 Regenerative:

This subclass is indented under subclass 173. Subject matter wherein the repeater including a regener ator for performing at least one of various functions, such as, sampling, data timing and signal clocking, clock recovering, pulse reshaping, signal amplifying or enhancing on the incoming optical beam and then transmits it without any demodulation.

(1) Note. This subclass includes positive feedback of the incoming signal.

176 Modulation conversion

This subclass is indented under subclass 175. Subject matter wherein the repeater converts the signal which is input from one type of modulation to another type of modulation

177 Monitoring:

This subclass is indented under subclass 173. Subject matter including apparatus to check the repeater system during operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

6, for fault recovery in a repeater system.

9 through 24 , for diagnostic testing of the optical communication system including fault location, test signal and fault detection.

33, for monitoring a supervisory signal for the determination of communication parameter.

SEE OR SEARCH CLASS:

356, Optics: Measuring and Testing, for optical testing of individual pie ces of an optical communication system, particularly subclass 73.1 for optical fiber or waveguide inspection.

714, Error Detection /Correction and Fault Detection /Recovery, subclasses 712 through 717 for the electrical testing of the information content of a tr ansmission facility.

178 Specific optical waveguide:
This subclass is indented under subclass 173. Subject matter including details of one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another withi n the confines of their outer surface by means of internal reflections or modal transmission.

(1) Note. This subject matter includes an optical waveguide in combination with an optical repeater system. For optical waveguide per se, see Search notes below.

SEE OR SEARCH THIS CLASS, SUBCLASS:
20, for fault detection of an optical fiber.
13, for fault location in an optical fiber or waveguide.
110, for remote control system in an industrial or hazardous environment through optical fiber or waveguide
113, for remote control system through optical fiber or waveguide.
116, for hybrid communication system including optical fiber.
134, for a photophone transducer including optical fiber or waveguide.
141, for transmitter and receiver system including optical waveguide, particularly 142 for specific type of fiber.
200, for transmitter including optical waveguide.
214, for receiver including optical waveguide.

SEE OR SEARCH CLASS:
250, Radiant Energy, subclasses 227.11 through 227.32 for photocell control that could be optical communication type modulator.
324, Electricity: Measuring and Testing, subclass 95 for measuring, testing, or sensing electricity, per se, with waveguide or long line.
385, Optical Waveguides, appropriate subclasses for optical waveguide structure, per se.

179 Soliton:
This subclass is indented under subclass 178. Subject matter wherein a narrow pulses of light that retains its shape as it travels long distance along the fiber is used in the r epeater system.

180 Specific optical elements:
This subclass is indented under subclass 173. Subject matter including details of optical elements used in order to provide regeneration or retransmission of a signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
212, for optical elements in a receiver.

SEE OR SEARCH CLASS:
359, Optical: Systems a nd Elements, subclasses 334 through 349 for optical amplifiers, control of the amplifiers and pumps.

181 Supervisory signal by repeater:
This subclass is indented under subclass 173. Subject matter includes a transmission of m anagement information for supervising or controlling purpose.

SEE OR SEARCH THIS CLASS, SUBCLASS:
30, for determination of an optical communication parameter using supervisory signal

182 TRANSMITTER:
This subclass is indented under the class definition. Subject matter including an opto-electric circuit for converting information signal into modulated optical signal suitable for propagating through or along a transmission medium.

(1) Note. The optoelectric circuit includes, for example, opto-electronic light sources such as LEDS, l aser diode, incandescent bulbs, an optical modulator and other elements associated with fiber optic or infrared transmission system required to communicate an information signal from one location to another via an optical beam.

SEE OR SEARCH THIS CLASS, SUBCLASS:

23, for fault detection in an optical transmitter.

135 through 139, for optical transceivers in an optical communication system.

140 through 172, for an optical transmitter and receiver system in an optical communication system.

173 through 181, for an optical rep eater communication system.

202 through 214, for an optical receiver in an optical communication system.

SEE OR SEARCH CLASS:

359, Optical: Systems and Elements, subclasses 237 through 324 for optical modulators, per se.

183 Having particular modulation:

This subclass is indented under subclass 182. Subject ma tter comprising details of a process in which information signal is coded into beams of optical energy by use of a carrier wave for transmission through an optical transmission medium (e.g., fiber).

(1) Note. The optical energy, include s, for example, visible, infrared, ultraviolet or laser.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclasses 493.1 through 504 H for radiant energy generation and sources.

348, Television, for projection TV modulated laser beam which requires scanning as distinguished from the optical communication of this class.

359, Optical: Systems and Elements, subclasses 237 through 324 for optical beam modulation without a transmitter.

369, Dynamic Information Storage or Retrieval, subclass 104 for a ribbon light modulator f or radiation beam modification of or by a storage medium.

372, Coherent Light Generators, subclass 38 for coherent light generators with particular component circuitry.

184 Including polarization:

This subclass is indented under subclass 183. Subject matter in which the vibration s of the optical signal at the transmitter is controlled.

185 Hybrid modulation:

This subclass is indented under subclass 183. Subject matter includes a) plurality of modulators or b) more than one type of modulation techniques.

(1) Note. The plurality of modulators can be used to perform same or different modulation techniques.

(2) Note. The plurality of modulators can be integrated as a unitary structure.

186 Intensity modulation:

This subclass is indented under subclass 183. Subject matter in which modulation is produced by modulating the amplitude o f a light wave serving as a carrier by another wave serving as modulating signal.

187 Frequency modulation:

This subclass is indented under subclass 183. Subject matter in which angle modulation is produced by causing the instantaneous frequency of a sine wave carrier to depart fr om a carrier frequency an amount that is proportional to the instantaneous value of a modulating signal.

(1) Note. Combinations of phase and frequency modulation are commonly referred to as frequency modulation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

183, for an optical transmitter using phase modulation.

188 Phase modulation:

This subclass is indented under subclass 183. Subject matter includes a form of angle modulation in which the instantaneous phase angle of a sine wave carrier varies proportionally with the instantaneous va lue of an amplitude of a modulating signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
182, for an optical transmitter using frequency or frequency and phase modulation.

189 Pulse modulation:
This subclass is indented under subclass 183.
Subject matter in which modulation is produced by modulating light wave serving as a carrier by a series of pulses with similar attributes by pulse length, pulse position or pulse amplitude.

(1) Note. This subclass includes pulse amplitude, delta, or pulse frequency modulation.

(2) Note. Pulse ampl itude modulation uses the amplitude of the transmitted carrier signal to convey the information contained in the modulating signal.

(3) Note. A delta pulse code modulation converts audio signals into corresponding trains of digital pulses to provide grea ter freedom from interference during transmission.

(4) Note. Pulse frequency modulation varies the transmitted pulse repetition rate as a function of the instantaneous value of the information signal (i.e., modulating signal).

SEE OR SEARCH THIS CLASS, SUBCLASS:
186, for pulse time modulation.

SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 100 through 333 for miscellaneous pulse parameter (e.g., amplitude) control.
329, Demodulators, subclasses 311-314 for electrical pulse demodulators.
332, Modulators, subclasses 106 through 116 for electrical pulse modulators.
370, Multiplex Communications, subclass 533 for multiplexers/distributors using pulse amplitude modulation.
375, Pulse or Digital Communications, subclass 353 for electrical pulse amplitude modulation. Subclasses 259-285, 301, and 321 for pulse or digital communications via modulated carrier waves.

190 Pulse-code:
This subclass is indented under subclass 189.
Subject matter in which modulation is produced by modul ating the light wave serving as a carrier by modulating the pulse length, amplitude or position by a definite code meaning.

(1) Note. The definite code meaning includes, foe example, analog to digital by a specific coding.

SEE OR SEARCH THIS CLASS, SUBCLASS:
186, for pulse time modulation.

191 Pulse time:
This subclass is indented under subclass 189.
Subject matter in which modulation is produced by modulating the light wave serving as a carrier by modulating the pulse length by a definite code in which the time of occurrenc e of a characteristic of a pulse carrier varies proportionally with respect to a characteristic of the modulating signal.

(1) Note. This subclass includes pulse position and pulse width modulation.

(2) Note. Pulse position modulation modulates the posi tion in time of a transmitted pulse with respect to each sampled instantaneous value of the information signal (i.e., modulating signal).

(3) Note. Pulse width, also identified as pulse duration, modulation controls the width of the transmitted pulse rel ative to each sampled instantaneous value of the information signal (i.e., modulating signal).

192 Including compensation:
This subclass is indented under subclass 182.
Subject matter wherein operating characteristic of the transmitter is corrected or adjusted to

reduce distortion or to improve system performance.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for compensation in an optical communication over free space.
136, for compensation in an optical transceiver.
147 through 148, for dispersion compensation in a transmitter and recei ver system.
158, for compensation in a transmitter and receiver system.
208, for post compensation in an optical receiver.

193 Precompensation (e.g., prechirping, predistortion):
This subclass is indented under subclass 192.
Subject matter including compensating means at the tra nsmitter for reducing or canceling distortion or noise that is expected to happen later in the optical communication system.

194 For noise or distortion:
This subclass is indented under subclass 192.
Subject matter including means for reducing or eliminating harmonic noise or int er-modulation product.

(1) Note. The inter-modulation product includes, for example, non-linear modulation, cross-talk, interference, etc.

195 Including feedback:
This subclass is indented under subclass 192.
Subject matter wherein operating characteristic is compensated by a fee dback controller.

SEE OR SEARCH THIS CLASS, SUBCLASS:
137, for feedback control in an optical transceiver.
213, for feedback control for optical elements in a receiver.
209, for feedback control for post compensation in a receiver.

196 For wavelength control:
This subclass is indented under subclass 195.
Subject matter wherein feedback signal is supplied to a laser or light emitting apparatus for regulating operating wavelength.

197 For power control:
This subclass is indented under subclass 195.
Subject matter wherein a feedback signal is supplied to a laser or light emitting apparatus for regulating energy level.

SEE OR SEARCH THIS CLASS, SUBCLASS:
38, for power parameter determination.
15, for power control in response to a fault.
94, for feedback power control in a multiplexing wavelength division or frequency division.
120, for power compensation in a free space optical communication system.
197, for feed back power compensation in a transmitter.

198 For modulator control:
This subclass is indented under subclass 195.
Subjec t matter wherein at least a portion of the optically transmitted light wave is sampled and used to further control operating parameter of the optical modulator.

(1) Note. The operating param e ter includes, for example, bias voltage.

199 Chirping:
This subclass is indented under subclass 182.
Subject matter in which the signal from the source emits a varying frequency during a pulse time which results in pulse compression in optical fibers.

200 Including optical fiber or waveguide:
This subclass is indented under subclass 182.
Subject matter including (a) a single or bundle of fiber used as a single transmission medium to propagate optical energy or (b) a system of material designed to confine direct optical waves in a direction determined by its physical boundary.

SEE OR SEARCH THIS CLASS, SUBCLASS:
20, for fault detection of an optical fiber.
13, for fault location in an optical fiber or waveguide.
110, for remote control system in an industrial or hazardous environment through optical fiber or waveguide

113, for remote control system through optical fiber or waveguide.
116, for hybrid communication system including optical fiber.
134, for a photophone transducer including optical fiber or waveguide.
141, for transmitter and receiver system including optical waveguide.
142, for specific type of fiber.
139, for optical transceiver including optical fiber or waveguide.
178, for optical repeater including optical waveguide.
214, for optical receiver including optical waveguide

201 Including specific optica l element:-
This subclass is indented under subclass 182.
Subject matter including details of at least one optical element which provide the optically transmitted signal.

(1) Note. The details include, for example, lens, mirror, etc.

202 RECEIVER:
Subject matter under class d efinition including an optoelectronic circuit for converting a received modulated optical signal (e.g., light or laser) into a signal corresponding to the information transmitted.

(1) Note. This classification is restricted to those devices peculiar to o ptical communication with information modulated thereon.

(2) Note. A mere recitation of a nonmodulated light control signal to control or activate an electrical amplifier is excluded from this subclass. See search note below.

(3) Note. An optoelectronic circuit contains, for example, an optical demodulator together with other elements associated with fiber optic or infrared transmission system required to communicate information from one location to another via an optical beam.

SEE OR SEARCH THIS CLASS, SUBCLASS:
135 through 139, for optical transceivers in an optical communication system.
140 through 172, for an optical transmitter and receiver system in an optical communication system.
173 through 181, for an optical repeater communication system.
182 through 201, for an optical transmitter in an optical communication system.

SEE OR SEARCH CLASS:
250, Radiant Energy, subclasses 206 through 214 for photocell controlled circuits of general utility, and subclasses 336.1–395 for invisible radiant energy responsive electric signaling.
330, Amplifiers, subclass 59 for electrical amplifiers combined with a nonmodulated light controlled or activated device that is not part of the amplifying device.
356, Optics: Measuring and Testing, appropriate subclasses for th e measuring or testing of an optical property.
359, Optical: Systems a nd Elements, subclasses 557 through 589 for filters (e.g. light interference) and subclasses 885-892 for absorption filters without communication.

203 Homodyne:
This subclass is indented under subclass 202.
Subject matter including a technique of reception using a locally generated voltage at a received carrier frequency for detection of the transmitted information signal.

(1) Note. This is also called a zero-beat reception.

(2) Note. Any further processing of the output of the demodulator will use electrical signals since the intermediate frequency (IF) output is outside the frequency spectrum of optical signals.

(3) Note. An electrical or optical local oscillator used in comb ination with a homo-

dyne optical receiver is classified in this subclass.

204 Heterodyne:
This subclass is indented under subclass 202.
Subject matter wherein a received wave is combined with a locally generated wave having a different frequency in a nonlinear device to produce bea t frequency signals at the output for detection of the transmitted information signal.

(1) Note. This is also called a beat reception.

(2) Note. Any further breakdown of the output of the demodulator will use electrical signals since the intermediate f requency (IF) output is outside the frequency spectrum of optical signals.

(3) Note. An electrical or optical oscillator used in combination with a heterodyne optical receiver is classified in this subclass.

(4) Note. The nonlinear device includes, for example, vacuum tube, transistor or diode mixer.

205 Including polarization:
This subclass is indented under subclass 204.
Subject matter in which the heterodyne receiver detects optical signal having controlled vibrations.

(1) Note. These vibrations are in straight lines (pla ne polarization), circles (circular polarization), or ellipses (elliptical polarization).

SEE OR SEARCH THIS CLASS, SUBCLASS:
24, for testing of an optical receiver.
152, for polarization in an optical transmitter and receiver communication system.
184, for polarization modulation.
203, for homodyne demodulation.

SEE OR SEARCH CLASS:
359, Optical: Systems or Elements, subclasses 246 through 258 for electro-optic modulation of polarize light, subclasses 281-283 for magneto-optic modulation of polarized light, subclass 301-304 for light wave directional modulation acting on polarized light, and subclasses 483-502 for polarization without modulation.

206 Having feedback:
This subclass is indented under subclass 205.
Subject matter in which at least a portion of heterodyned signal is sa mpled and used to further control local oscillator or received signal.

207 Specific optical elements:
This subclass is indented under subclass 204.
Subject matter including details of optical elements used in order to provide the heterodyne function (i.e., combining local oscillat ion signal with received wave).

208 Including postcompensation:
This subclass is indented under subclass 202.
Subject matter including means at a receiver location for reducing distortion caused earlier in an optical transmission system.

(1) Note. The distortion includes, for ex ample, dipersion, nonlinearitie, noise.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for compensation in an optical communication system over free space.
136, for compensation in an optical transceiver.
147 through 148, for dispersion compensation in a transmitter and receiver system.
158, for compensation in a transmitter and receiver system.
192, for compensation in an optical transmitter.
196, for precompensation in an optical transmitter.

209 Feedback:
This subclass is indented under subclass 208.
Su bject matter in which at least a portion of the received signal is sampled and used to further control the received light beam.

SEE OR SEARCH THIS CLASS, SUBCLASS:
137, for feed back control in an optical transceiver.
195, for compen sation with feedback control in an optical transmitter.
213, for feedback control for optical elements of a receiver.

210 Amplitude:
This subclass is indented under subclass 208.
Subject matter including means for sampling a portion of a signal to control the intensity of the signal.

211 Intermodulation:
This subclass is indented under subclass 208.
Subject matter including means at a receiver location for compensating for problems with intermodulation products or harmonic distortion.

212 Specific optical element (e.g., lens, mirror, etc.):
This subclass is indented under subclass 202.
Subject matter wherein an optical receiver comprises details of at least one optical element which are used to aid the reception of signal.

(1) Note. The details include, for e xample, lens, mirror, etc.

(2) Note. Optical waveguide or fiber is excluded from for this subclass. See Search note below.

SEE OR SEARCH THIS CLASS, SUBCLASS:
180, for specific optical elements in a repeater system.

SEE OR SEARCH CLASS:
385, Optical Waveguides, appropriate subclasses for optical waveguide structure, per se.

213 Having feedback:
This subclass is indented under subclass 212.
Subject matter in which at least a portion of the received signal is sampled and used to further control the at least one optical element in the receiver.

SEE OR SEARCH THIS CLASS, SUBCLASS:
137, for feedback control in an optical transceiver.
195, for compensation with feedback control in an optical transmitter.
209, for feedback for post compensation in an optical receiver.

214 Including optical fiber or waveguide:
This subclass is indented under subclass 202.
Subject matter having one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another within the confines of their outer surface by means of internal reflections or modal transmission.

(1) Note. An optical waveguide requires total internal reflection.

(2) Note. This subclass includes a combination of an optical receiver and an optical waveguide. See Search note below fo r optical waveguide, per se.

SEE OR SEARCH THIS CLASS, SUBCLASS:
20, for fault detection of an optical fiber.
13, for fault location in an optical fiber or waveguide.
110, for remote control system in an industrial or hazardous environment through opti cal fiber or wave guide
113, for remote control system through optical fiber or waveguide .
116, for hybrid communication system including optical fiber.
134, for a photophone transducer including optical fiber or waveguide.
141, for transmitter and receiver system including optical waveguide, and subclass N3 for specific type of fiber.
139, for optical transceiver including optical fiber or waveguide.
178, for optical repeater including optical waveguide.
200, for transmitter including optical wave guide.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclass 206 for photocell control that could be an optical Communication type modulator.

324, Electricity: Measuring and Testing, subclass 95 for measuring, testing, or sensing electricity, per se, with waveguide or long line.

385, Optical Waveguides, appropriate subclasses for optical waveguide structure, per se.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for *indented* art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 OPTICAL COMMUNICATION:
Foreign art collection under the class definition wherein an information signal is transmitted through a medium between an optical transmitter and optical receiver by means of variation in a characteristic of light waves.

FOR 101 Diagnostic testing of optical communication:
Foreign art collection under FOR 100 wherein the system as a whole, not just a single piece of the system, is evaluated prior to the communication use.

FOR 102 Interference signal transmission or elimination (e.g., jamming or antijamming):
Foreign art collection under FOR 100 wherein a signal, used to interfere with a selected signal so as to prevent the intelligible reception of the selected signal, is either transmitted or eliminated.

FOR 103 Eavesdropping:
Foreign art collection under FOR 100 wherein the information content of an optical communication message intended for one receiver is obtained surreptitiously by another without the other parties being notified.

FOR 104 Duplex:
Foreign art collection under FOR 100 wherein a single optical link between an optical transmitter and receiver permits simultaneous transmission and reception of plural optical signals in the same or opposite directions.

FOR 105 Wavelength division:
Foreign art collection under FOR 104 wherein bi-directional transmission over a single fiber is permitted by causing two light beams to travel in different wavelength bands and different directions within the same medium.

FOR 106 Multiplex:
Foreign art collection under FOR 100 wherein two or more information signals are controlled to be interleaved or simultaneously transmitted in either or both directions over a common (same) transmission medium in such a manner that the information signals may be directly recovered.

FOR 107 Mode:
Foreign art collection under FOR 106 wherein each light beam is applied to an optical cable at an angle which differs from the other light beams in order to be able to distinguish the light beams when they are applied to the cable simultaneously.

FOR 108 Spatial or switching:
Foreign art collection under FOR 106 wherein multiple information beams are separated by the use of a switch to selectively direct individual information portions of a light beam to either separate individual light conductive elements or separate directions in space.

FOR 109 Optical local area network (LAN):
Foreign art collection under FOR 106 wherein multiple optical stations are interconnected via a network of fiber optics to enable transmission and reception between the stations.

FOR 110 Loop:
Foreign art collection under FOR 109 wherein the local area network consists of a series of stations connected to each other and the last station is connected to the first station.

FOR 111 Active star:
Foreign art collection under FOR 109 wherein an optical data distribution system, containing a common node connected to one end of each of three or more branches and the other end of the branches are connected to each member of a local area network multiplex system, permits optical information flow between all of the members; and each member receives its power (i.e., active) from the received optical signals.

FOR 112 Passive star:
Foreign art collection under FOR 109 wherein an optical data distribution system, containing a common node connected to one end of each of three or more branches and the other end of the branches are connected to each member of a local area network multiplex system, permits optical information flow between all of the members; and each member has its own power supply (i.e., passive) and does not change the power of the optical signals it receives from each member.

FOR 113 Polarization:
Foreign art collection under FOR 106 wherein the multiple signals are distinguished from one another by the particular individual signal vibration perpendicular to the ray direction of travel.

FOR 114 Time and frequency division:
Foreign art collection under FOR 106 wherein information is transmitted on different segments of a transmission medium, which segments are divided based upon the frequency spectrum and discrete time intervals.

FOR 115 Wavelength division/frequency division (includes scattering, e.g., Raman, Brillouin, etc.):
Foreign art collection under FOR 106 wherein (1) two or more information optical signals simultaneously present on a common optical waveguide are differentiated by optical wavelength or (2) the frequency spectrum of the optical transmission medium is divided into segments and respective information channels are transmitted in differing segments.

FOR 116 Subscriber system:
Foreign art collection under FOR 115 comprising plural stations prearranged to enable preselected stations to receive identified information at the same time it is transmitted.

FOR 117 Optical source at only one station:
Foreign art collection under FOR 116 wherein the optical beam communicated to all of the other stations in the system originates from a single station.

FOR 118 By optical coupling:
Foreign art collection under FOR 115 wherein the multiplexing is accomplished by the optical device itself, which permits the transfer of light from one element to another.

FOR 119 Switch:
Foreign art collection under FOR 118 wherein the optical coupler selectively determines which output receives the input light beam.

FOR 120 Prism:
Foreign art collection under FOR 118 wherein a beam is coupled in or out of a waveguide to accomplish the desired multiplexing by one or more transparent bodies bounded in part by two plane surfaces which are angularly related (i.e., not parallel), at least one of these surfaces being internally reflecting or refracting to impinging incident light.

FOR 121 Grating:
Foreign art collection under FOR 118 wherein (1) a beam is coupled in or out of a waveguide to accomplish the desired multiplexing by narrow parallel slits in a plate or (2) narrow parallel reflecting surfaces made by ruling grooves on polished metal break up the light waves as they emerge.

FOR 122 Lens:
Foreign art collection under FOR 118 wherein a beam is coupled in or out of a waveguide to accomplish the desired multiplexing by a trans-parent optical component consisting of one or more pieces of optical glass with the surfaces so curved (usually

spherical) that they serve to converge or diverge the transmitted rays.

FOR 123 Single source, electrically controlled:
Foreign art collection under FOR 115 wherein a single source of light is either wavelength division or frequency division optical multiplexed via an external electrical control signal.

FOR 124 Different sources:
Foreign art collection under FOR 115 wherein each channel of the common optical waveguide is supplied with data from separate origins of light.

FOR 125 With pump:
Foreign art collection under FOR 124 wherein the atoms, in at least one of the sources of a medium, are caused to be raised from certain lower to certain higher energy levels to cause population inversion between certain intermediate levels in order to ultimately produce photons when the energy level moves from higher to lower levels.

FOR 126 Time division:
Foreign art collection under FOR 106 wherein access to the optical transmission medium is divided into discrete time intervals and information from respective channels is transmitted in differing time intervals.

FOR 127 Multiple access (e.g., CSMA, CDMA):
Foreign art collection under FOR 126 wherein stations use a protocol to obtain access of a channel before sending a packet of information.

FOR 128 Subscriber System:
Foreign art collection under FOR 126 wherein the system is developed to communicate with prearranged plural time division multiplexed stations, thus enabling all preselected stations to receive identified information at the same time it is transmitted.

FOR 129 By specific optical element:
Foreign art collection under FOR 126 wherein the time division optical multiplexing is produced by specifically identified optical elements.

FOR 130 Optical switch (359/139):
Foreign art collection under FOR 129 wherein the input light beam is optically directed to selected outputs in order to accomplish time division optical multiplexing.

FOR 131 With delay:
Foreign art collection under FOR 126 wherein the time division optical multiplexing is accomplished by the use of some delay of the input light beam.

FOR 132 Underwater:
Foreign art collection under FOR 100 wherein optical communication is performed via a light beam actually traveling through the water.

FOR 133 Remote control:
Foreign art collection under FOR 100 wherein a variable device is used to modulate an optical transmitter at a first location in order to control a remote electrically operated second device at a second location via an optical communication link between the transmitter and an optical receiver located at the second location and connected to the second device.

FOR 134 Bidirectional (i.e., monitoring or acknowledge):
Foreign art collection under FOR 133 wherein the optical equipment remotely controls the second device, which is unrelated to the optical system, and either (1) receives a response from the second device indicating that the optical control signal was received or (2) monitors the second device.

FOR 135 In industrial environment (e.g., robot control):
Foreign art collection under FOR 133 wherein the second device, which is remotely controlled with optical communication, is used in the production of some manufactured product.

FOR 136 With radio link:
Foreign art collection under FOR 133 wherein multiple remote devices are optically controlled via a single optical beam, but the beam is only directed at one device

and this device relays control to another device via radio waves.

FOR 137 With television or radio system:
Foreign art collection under FOR 133 wherein the optical link remotely controls a television or radio.

FOR 138 Switching:
Foreign art collection under FOR 133 wherein specific connections of the remote device are controlled by an optical beam.

FOR 139 Plural functions:
Foreign art collection under FOR 133 wherein more than one control is activated via the optical beam received at the remote device.

FOR 140 Photophone:
Foreign art collection under FOR100 wherein an audio signal, as the information signal, is directly modulated onto a light beam.

FOR 141 Transducer, per se:
Foreign art collection under FOR140 wherein the details of a device are specified, which produces a conversion between an optical beam and nonoptical energy (e.g., acoustic, electrical).

FOR 142 With optical fiber or waveguide:
Foreign art collection under FOR 141 wherein the transducer either contains an optical fiber or waveguide or is connected to one.

FOR 143 Optical transceiver:
Foreign art collection under FOR 100 wherein an optical transmitter and receiver are at a common location for transmission and reception of separate signals, and an optical signal is transmitted using some of the same equipment used for the reception of another optical signal.

FOR 144 Including compensation:
Foreign art collection under FOR 143 wherein structure is provided within the optical transceiver to eliminate any information errors that the transceiver would produce while transmitting a response.

FOR 145 Transmitter and receiver system:
Foreign art collection under FOR 100 wherein both the transmitter and receiver are located at separate stations for point-to-point communication from the transmitter at one location to the receiver at another location, remote from the transmitter.

FOR 146 Presence detection:
Foreign art collection under FOR 145 wherein an optical transmitter and receiver system is used to determine if an object is present within the range of the optical beam.

FOR 147 With polarization:
Foreign art collection under FOR 145 wherein the optical beam of the transmitter and receiver system vibrates perpendicular to the beam s traveling direction.

FOR 148 One transmitter, plural receivers:
Foreign art collection under FOR 145 wherein optical information received at multiple locations is delivered by a single transmitter.

FOR 149 With synchronization:
Foreign art collection under FOR145 wherein all transmitters and receivers operate in the same time frame and their respective clocks are maintained to be at the same time and operating in an identical manner.

FOR 150 With alignment between transmitter and receiver:
Foreign art collection under FOR 145 wherein the transmitter and receiver are always pointed at one another.

FOR 151 With pumping:
Foreign art collection under FOR145 wherein the atoms of a medium at the transmitter are caused to be raised from certain lower to certain higher energy levels to cause a population inversion between certain intermediate levels in order to ultimately produce photons when the energy level moves from higher to lower levels.

FOR 152 With compensation:
Foreign art collection under FOR 145 wherein structure is provided within the optical system to eliminate from the trans-

mitted response any information errors that the system would produce.

FOR 153 With electrical oscillator:
Foreign art collection under FOR145 wherein the transmitter and receiver optical communication system uses an electrical device whose output voltage or current is a periodic function of time.

FOR 154 With optical circuit board:
Foreign art collection under FOR 145 wherein a waveguide breadboard is used to plug the transmitter and receiver into any desired location along the breadboard.

FOR 155 Plural stations:
Foreign art collection under FOR 145 including at least two spaced apart stations each having a transmitter which communicates with a receiver located remote from the transmitter.

FOR 156 Address directing connections:
Foreign art collection under FOR 155 wherein the optical beam is directed to the proper station as a result of the station destination information (address) attached to the communication data on the same optical beam.

FOR 157 Unidirectional or loopback:
Foreign art collection under FOR 155 wherein plural stations, each having both a transmitter and receiver, are serially linked by the transmitter of the preceding station transmitting to the receiver of the next station and the last station of the system transmits to the receiver of the first station of the system.

FOR 158 Central or master station:
Foreign art collection under FOR 155 wherein a single central or master station, having both an optical transmitter and receiver, transmits to all of the stations in the system and also receives responses from all of the stations of the system.

FOR 159 Passive system:
Foreign art collection under FOR 145 wherein the receiver derives its power to activate itself from the beam transmitted by the transmitter.

FOR 160 Retroreflection:
Foreign art collection under FOR159 wherein the transmitted response to a received optical beam is transmitted in the opposite direction of the received beam to ensure that the original transmitter receives the response.

FOR 161 Retroreflection:
Foreign art collection under FOR 145 wherein the transmitted response to a received optical beam is transmitted in the opposite direction of the received beam to ensure that the original transmitter receives the response.

FOR 162 Received signal supplies power distribution to diverse devices:
Foreign art collection under FOR 145 wherein the power for operation of devices unrelated to the transmitter and receiver system is obtained from the received signal.

FOR 163 Satellite communications:
Foreign art collection under FOR 145 wherein communication is accomplished with either (1) a space orbiting satellite or (2) a land satellite.

FOR 164 Including optical waveguide:
Foreign art collection under FOR 145 which further includes one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another within the confines of their outer surface by means of internal reflections or modal transmission.

FOR 165 Optical repeater system:
Foreign art collection under FOR 100 including apparatus for receiving a light wave signal and reradiating the signal at a different carrier frequency and usually at a higher energy level or in a desired direction.

FOR 166 Demodulating:
Foreign art collection under FOR 165 wherein the optical repeater extracts the information content of the signal it receives prior to reradiating the signal at the same or different carrier frequency.

FOR 167 Regenerative:

Foreign art collection under FOR 165 wherein the repeater samples the incoming optical beam without any demodulation and then transmits it with perfect timing and no distortion.

FOR 168 Monitoring:
Foreign art collection under FOR 167 wherein the regenerative repeater includes apparatus to check the system during operation.

FOR 169 Star:
Foreign art collection under FOR 165 wherein an optical data distribution system contains a common node connected to one end of each of three or more branches and the other end of the branches are connected to appropriate elements of an optical repeater.

FOR 170 Including optical waveguide:
Foreign art collection under FOR 165 which further includes one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another within the confines of their outer surface by means of internal reflections or modal transmission.

FOR 171 Transmitter:
Foreign art collection under FOR 100 which converts information signals into modulated light wave signals suitable for propagation through or along a transmission medium.

FOR 172 With particular modulation:
Foreign art collection under FOR 171 wherein apparatus is set forth to include the information signal in a specified manner onto a light wave carrier entering the device.

FOR 173 Frequency modulation:
Foreign art collection under FOR 172 wherein the instantaneous amplitude of the information signal (i.e., modulating signal) modulates a carrier so that its instantaneous frequency differs from the carrier frequency by an amount proportional to the information signal amplitude.

FOR 174 Phase modulation:
Foreign art collection under FOR 172 wherein the instantaneous amplitude of the information signal (i.e., modulating signal) modulates a sine-wave carrier so that its instantaneous angle (i.e., phase) deviates from the original (no-signal) angle by an amount proportional to the information signal amplitude.

FOR 175 Pulse modulation:
Foreign art collection under FOR 172 wherein the carrier signal is transmitted in a series of pulses, having a normally constant value with a variation of a rise and a decay approaching infinitesimal duration, to convey the information contained in the modulating signal.

FOR 176 Pulse-code:
Foreign art collection under FOR 175 wherein the information signal is periodically sampled and each sample is quantized and transmitted as a digital binary code.

FOR 177 Pulse time:
Foreign art collection under FOR 175 wherein the values of instantaneous samples of the information signal (i.e., modulating signal) are made to modulate the occurrence time of some characteristic of a pulse carrier.

FOR 178 With feedback:
Foreign art collection under FOR 171 wherein at least a portion of the optically transmitted light wave is sampled and used to further control the transmitted light beam.

FOR 179 Including optical waveguide:
Foreign art collection under FOR 171 which further includes one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another within the confines of their outer surface by means of internal reflections or modal transmission.

FOR 180 Receiver:
Foreign art collection under FOR 100 wherein the information or modulating signal which has been transmitted may be derived from the received modulated light wave signals and converted into signals corresponding to the information transmitted.

FOR 181 Homodyne:

Foreign art collection under FOR 180 wherein a locally generated voltage at the received carrier frequency will result in a zero beat reception for detection of the transmitted information signal.

FOR 182 Heterodyne:
Foreign art collection under FOR 180 wherein the received wave is combined with a locally generated wave in a nonlinear device to produce sum and difference frequencies at the output receiver is classified in this subclass.

FOR 183 With polarization:
Foreign art collection under FOR 182 wherein the heterodyne optical demodulating receiver is used to detect a light wave having vibrations perpendicular to the direction of travel of the light beam.

FOR 184 With optical element (e.g., lens, mirror, etc.):
Foreign art collection under FOR 180 wherein an optical receiver comprises some type of optical device such as a lens, etc., other than an optical waveguide.

FOR 185 Automatic gain control:
Foreign art collection under FOR 180 wherein the amplitude of an output signal amplitude is maintained constant either by an optical or electrical device.

FOR 186 With optical waveguide:
Foreign art collection under FOR 180 which further includes one or more transparent elongated structures (e.g., rods, fibers, or pipes) which are used to transmit light waves from one point to another within the confines of their outer surface by means of internal reflections or modal transmission.

END